SERVICE MANUAL

MODEL GP-4D

PORTABLE COLOR CAMERA

Hitachi Denshi, Ltd.
TOKYO, JAPAN

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NOTICE

This Service Manual describes the most typical product of this model. If there are any specific differences between this Manual and the servicing unit, please contact Hitachi Denshi sales office in your area.

PRODUCT SAFETY NOTICE

(1) X-RAY RADIATION

The primary source of X-ray radiation in this viewfinder is the picture tube. The tube used in this viewfinder is especially constructed to limit X-ray radiation emission. For continued X-ray radiation protection, the replacement tube must be the same type as the original, Hitachi approved one.

(2) PRODUCT SAFETY NOTE

Many electrical and mechanical parts in this viewfinder have special safety related characteristics. These characteristics are often not evident from visual inspection nor can the protection afforded by them necessarily be obtained by using replacement components rated for higher voltage, etc.

Electrical components having such features are identified by marking with a on the schematic diagram and parts list in this manual. The use of a substitute replacement component which dose not have the same safety characteristics as the Hitachi recommended replacement one, shown in the parts list in this manual, may create shock, fire, X-radiation or other hazards.

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Service Manual

1. DESCRIPTION OF PARTS

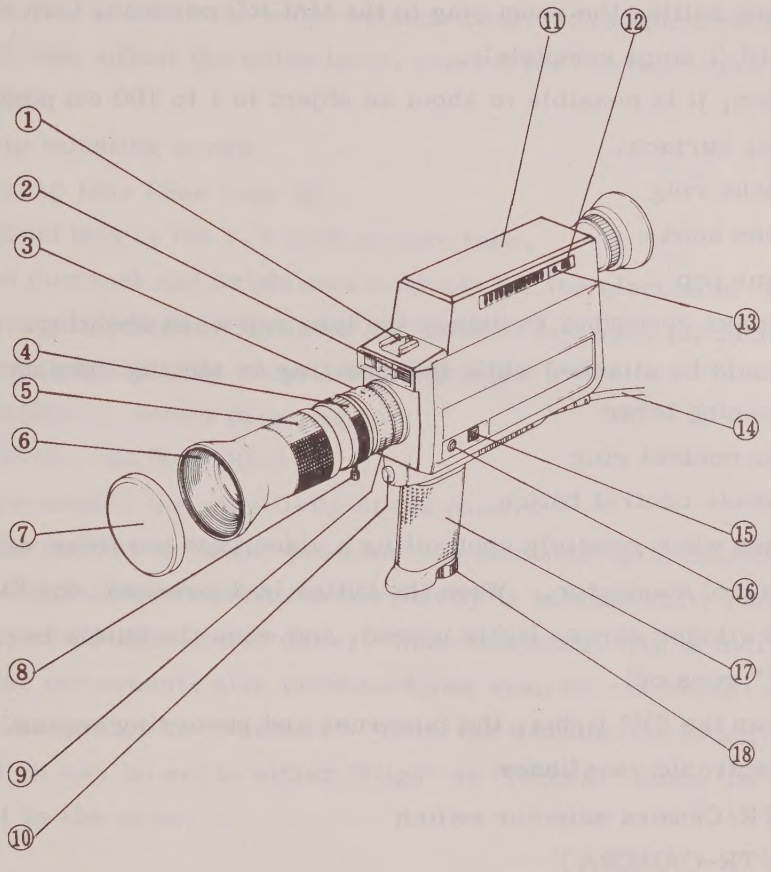


Fig. 1-1

① Adaptor shoe

Used to secure an external microphone or other accessory.

② Omnidirectional condenser microphone

This picks up the sound to be recorded.

③ External mic jack [MIC]

This is the jack for connecting and external microphone.

Once such a microphone has been connected, the built-in ominidirectional condenser microphone is cut off.

④ Zooming ring

When setting the zoom ring to the MACRO position, turn the ring fully until it stops completely.

Then, it is possible to shoot an object in 1 to 100 cm position from the lens surface.

⑤ Focus ring

⑥ Lens hood

⑦ Lens cap

Always remember to detach the lens cap when shooting. The cap should be attached while transporting or storing the camera.

⑧ Zooming lever

⑨ Iris control ring

⑩ Remote control button

Used when remotely controlling a video tape recorder with a remote control connector. When the button is depressed, the "V" above the viewfinder screen lights up red, and when the button is released, the "V" goes out.

When the "V" lights, the tape runs and recording begins.

⑪ Electronic viewfinder

⑫ VTR/Camera selector switch

[VTR-CAMERA]

When this is set to "CAMERA," it is possible to see the pictures being shot. When set to "VTR," it is possible to monitor the pictures recorded on the VTR. To monitor the sound, plug the earphone into the earphone jack.

⑬ Earphone jack [EAR]

⑭ Camera cable

⑮ White balance meter

Shoot a white object and then adjust so that the meter indicates the center. (Do not set the lens aperture to "closed.")

⑯ Color temperature control [COLOR TEMP]

Rotate this knob in accordance with the color temperature of the light source, observe the white balance meter or the pictures on the monitor and then adjust the color temp. control for the best color.

⑰ Grip

⑱ Grip mounting screw

⑲ Eyecap lens (See page 4)

Behind this is the 1.5-inch picture tube.

The contrast and brightness controls for the electronic viewfinder are factory adjusted. However, if there is any need for further adjustment, adjust using a small screwdriver.

⑳ Sensitivity switch (See page 4)

[SENS, HIGH-NORM]

This selects the sensitivity of the camera.

When set to the "High" position, the automatic gain control (AGC) circuit is actuated and the sensitivity is automatically raised when the subject illumination is dark. When the sensitivity is increased, the noise components also increased and when this is found to be irritating, set the switch to "Normal." When the illumination is sufficient, the switch may be set to either "High" or "Normal" since the sensitivity will be the same.

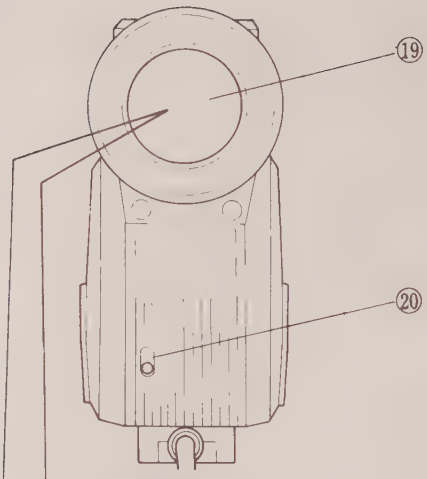


Fig. 1-2

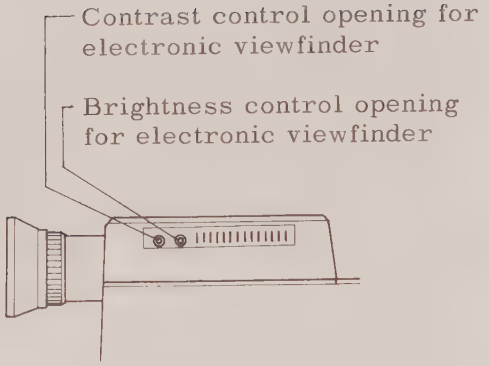


Fig. 1-3

Caution
The contrast and brightness of the pictures on the viewfinder is adjusted by a small screwdriver. Any adjustments, however, have no effect on the pictures recorded onto the VTR.

- VTR start indicator: When this camera is used in combination with a VTR, the tape will start to run and recording will begin when the remote control button is depressed and the "V" lights up red. When the button is depressed again, the "V" goes out to indicate that the tape has stopped.

- Low light indicator: When an incident light is insufficient, the "L" lights up red to indicate underexposure. This indicator goes out when the iris control ring is rotate and the f-number is reduced. When it will not go out, check that the lens cap has been removed and increase the illumination in order to take better pictures.

- Battery warning indicator: When the camera is connected to a portable VTR, the "B" lights up red if the voltage of the VTR battery falls below the rating. Once this indicator has lighted, charge the battery which is built-in to the portable VTR.

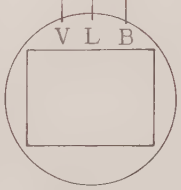


Fig. 1-4

2. SPECIFICATIONS

Pickup tube	Single tri-electrode pickup tube, HS-253 or equivalent
Color system	U,C: NTSC/E,K: PAL
Sync system	Internal sync
Scanning lines	U,C: 525 lines, 2:1 interlace E,K: 625 lines, 2:1 interlace
Video output	1Vp-p, 75Ω (unbalanced)
Video signal-to-noise ratio	Better than 45 dB (luminance channel, AGC OFF)
Recommended subject illumination	500 lux or more (f/1.6)
Minimum illumination	75 lux (f/1.6)
Built-in microphone	Omnidirectional electret condenser microphone
External mic input	-65 dB, high impedance
Audio line output	-20 dB, low impedance
Accessory lens	f/1.6, 14-81mm 6x zoom
Lens mount	C mount
Filter screw diameter	52 mm, 0.75 mm screw pitch
Viewfinder	Electronic viewfinder Picture tube: 1.5-inch tube Usable earphone: magnetic earphone (10Ω) Video input: 1 Vp-p, 75Ω (unbalanced) Display functions: VTR start, low light, battery warning Audio input: 0 dB, high impedance
Color temperature adjustment	From tungsten lamp illumination to cloudy sky
Automatic sensitivity control	75 - 100,000 lux
Power requirements	12 V DC, 8.0W
Dimensions	75 (W) x 171 (H) x 423 (D) mm (excl. grip)

	75 (W) x 271 (H) x 423 (D) mm (incl. electronic viewfinder, 6x zoom lens, grip)
Weight	2.2 kg (with electronic viewfinder, 6x zoom lens, grip and camera cable)

* The specifications and design are subject to change without notice.

3. DISASSEMBLY METHOD

3.1 Removal of the side cover

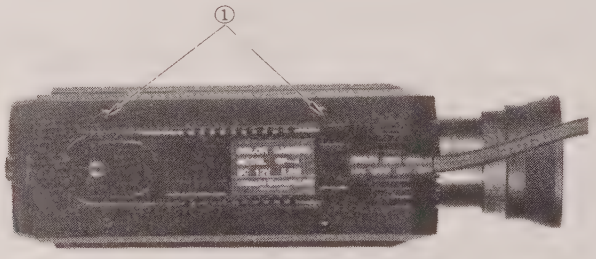


Fig. 3-1

1) Remove the 2 screws (1) fixing the lower side of the cover.
2) Pull the lower side of the cover forward, and lower the entire cover to remove it.
3) Assemble in reverse order of the above. Tighten the screws after confirming that the color temperature meter is in the hole of the side cover (L).

3.2 Removal of the viewfinder

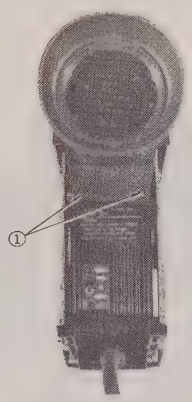


Fig. 3-2

1) Remove the electronic viewfinder with side cover removed.
2) Remove the 2 screws (1) holding the electronic viewfinder on the rear part.
3) Pull the electronic viewfinder to the rear. Then pull the rear part upwards and remove it. The lead wires from the electronic viewfinder are inserted into the printed circuit board connectors. Take care not to pull the wires.
4) Assemble in the reverse order of the above.

3.3 Vidicon exchage method

1) Remove the C mount (3 screws (1)).

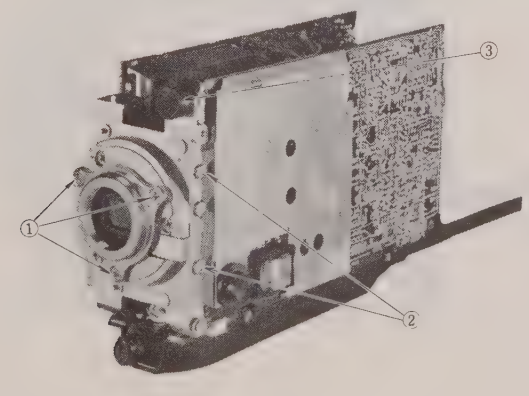


Fig. 3-3

2) Remove the shield plate (2 screws (2)).

3) Remove the microphone (3) .

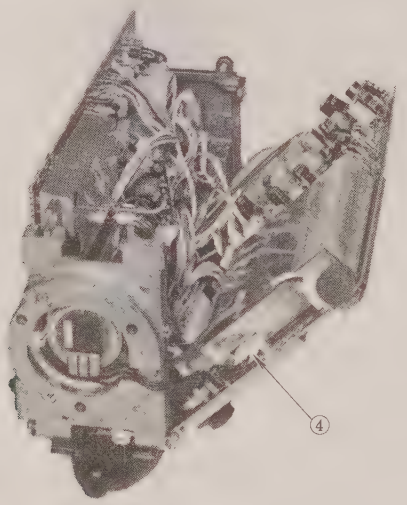


Fig. 3-4

4) Open the VIDEO PC board (2 screws (4)) and disconnect the target connector.

5) Open the SYNC/DEF PC board (2 screws (5)) and remove the FILT PC board.

6) Loosen the vidicon clamp screw (6) and push the vidicon gently from the rear.

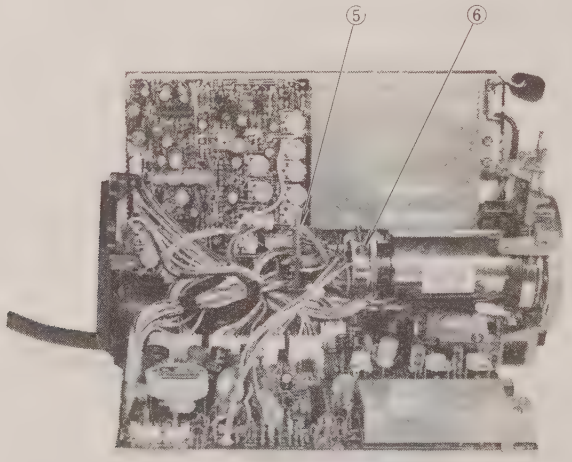


Fig. 3-5

7) Remove the vidicon gently from the front.
Insert the new vidicon as shown in the photo with the target terminal on the bottom.

8) Confirm that the vidicon has been inserted completely. Then tighten the vidicon clamp screw (6) temporarily so that the vidicon can be moved back and forth. Do not tighten the screw tightly.

9) Insert the FILT PC board. At this time, take care not to bend the vidocon pins.

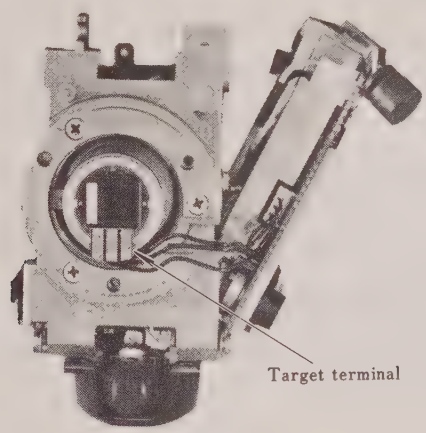


Fig. 3-6

10) Connect the target connector and install the microphone. Then close the VIDEO PC board. At this time, take care that the vidicon target lead wire is not caught between the shield plate and the VIDEO PC board.

11) Install the C mount. At this time, pay attention that the vidicon target lead wire is not caught between the die cast and the C mount.

12) Install the lens and adjust according to the item 3.4 "adjustment after vidicon exchange."

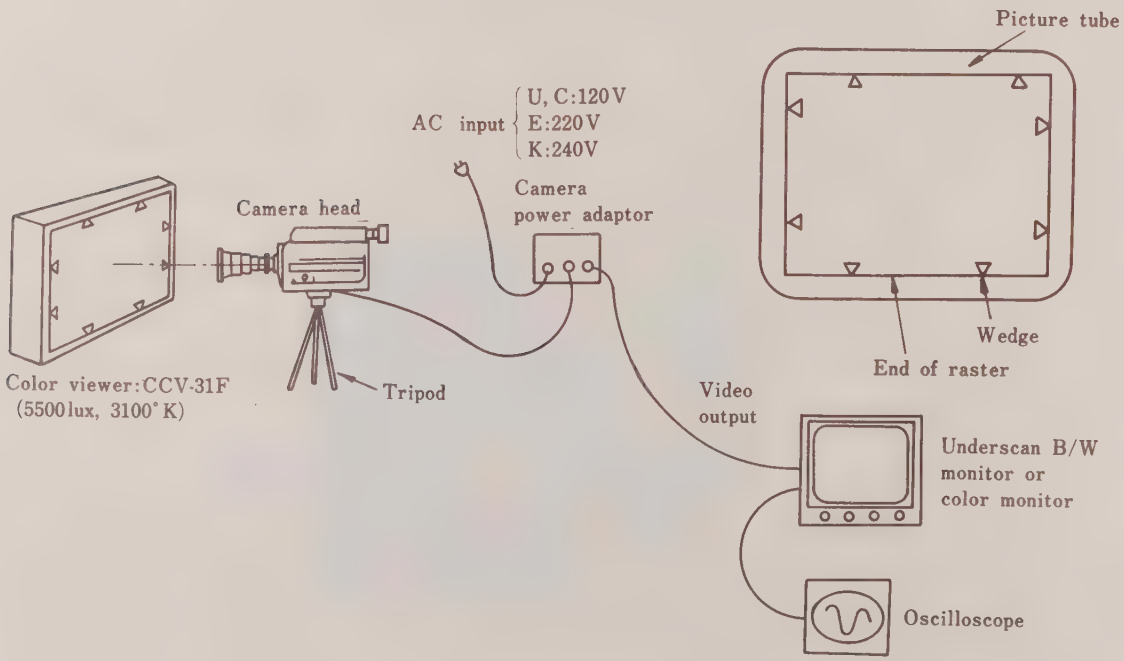
Note:
When inserting the vidicon, use clean gloves to prevent sweat, dirt, etc. from getting onto the face plate or bulb. Attachment of sweat, dirt, etc. causes picture quality deterioration. Remove any dirt with deerskin, lens cleaning fissue, etc.

3.4 Adjustment after vidicon exchange

CAUTION: High voltage exists in some areas on the SYNC/DEF PC board. Excercise proper care to avoid possible electric shock hazard.

Set up the Camera following the steps and illustration below:

1) Remove the side covers of camera.
   (Refer to page 6.)
2) Connect the Camera, Camera Power Adaptor, Underscan Monitor and Oscilloscope as illustrated below.
   (1) Adjust zoom ring, so that all of the wedge markings of test pattern of the Underscan Monitor are within the raster. Then firmly secure the tripod of Camera.
   (2) At first, use an underscan black and white monitor for setup. When performing color adjustment use a color monitor instead. (An underscan color monitor is not required.)



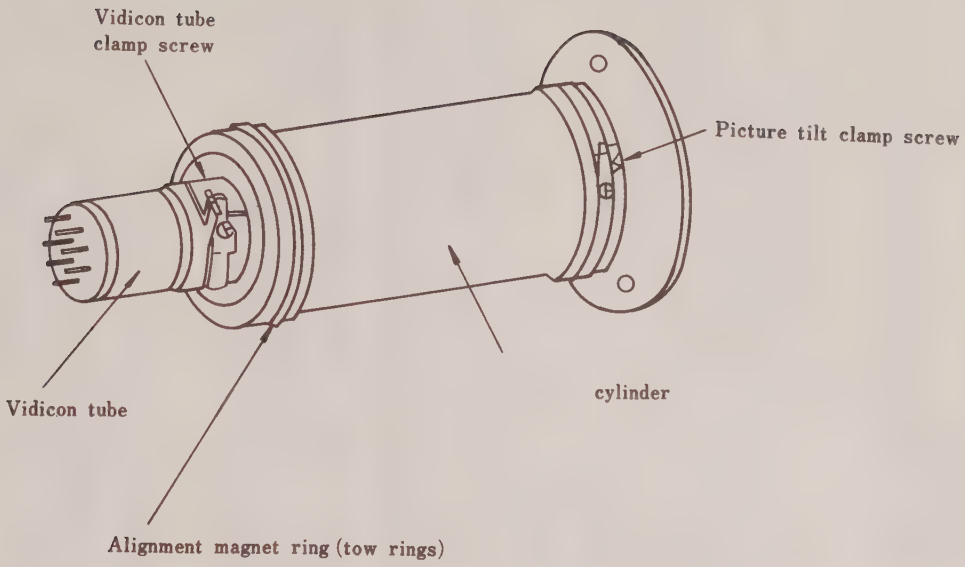


Fig. 3-7

As for the coil assembly related adjustment, refer to the following pages.

1) Alignment adjustment ..... See page 12.

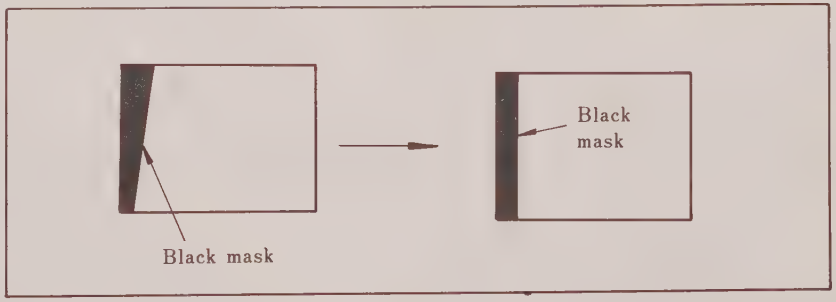
2) Back focus adjustment ..... See page 13.

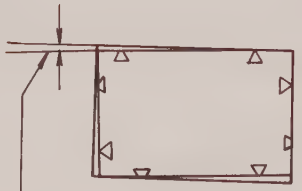
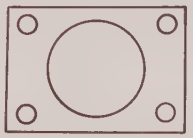
3) Black mask tilt adjustment ..... See page 13.

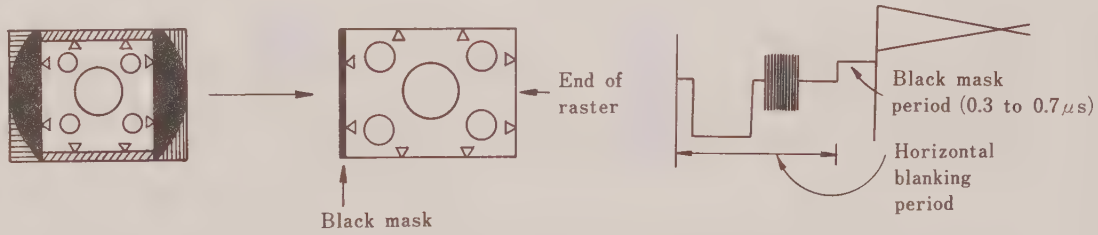
4) Picture tilt adjustment ..... See page 14.

No.	Adjustment point	Adjustment
1	Power supply voltage VR203 (SYNC/DEF PCB)	1. Connect a digital voltmeter to TP4 or pin 1 of CN204. 2. Adjust VR203 so that the power supply voltage reads +9±0.05 V.
2	Subcarrier frequency VC201 (SYNC/DEF PCB)	1. Connect a frequency counter to TP11 or Q218 base. 2. Adjust VC201 so that the subcarrier frequency read next adjustment value. NTSC : 3.579545 MHz ± 30 Hz PAL : 4.433619 MHz ± 30 Hz
3	Beam quantity VR206 (SYNC/DEF PCB)	Turn once all the way in the direction where the picture disappears (Clockwise rotation as seen from the parts side of printed circuit board) and then gradually in the direction where the picture appears (Counterclockwise rotation as seen from the parts side of printed circuit board). Shoot a fluorescent lamp at a distance of 4 to 5 m, move the camera horizontally and vertically, and adjust so that the lamp does not have too much of a tail on the screen. At this time, the lens is open. Note: Never shoot the sun.
4	Focus and alignment VR205 (SYNC/DEF PCB)	1. Set for the best possible sharpness of the picture. If the screen center moves horizontally or vertically as shown below with repeated turning of VR205 near just focussed point, turn two alignment magnet rings on the rear of the coil assembly (See Fig.3-7) and adjust them so that the screen center appears to move in forward and backward directions.

No.	Adjustment point	Adjustment
	Alignment magnet rings (See Fig. 3-7.)	 Bad alignment of coil assembly (The screen center moves.) (I) If correct alignment of the coil assembly is obtained, the screen center does not move. (II) 2. Apply paint lock to the alignment magnet ring after completion of the adjustment.
5	Focus and black mask tilt Vidicon (See Fig. 3-7.)	1. Back focus adjustment 1) Open the lens iris and set the lens to infinity. 2) Loosen the vidicon tube clamp screw on the coil assembly. (See Fig. 3-7.) 3) When the focus is blurred by zooming operation, move the vidicon forward and backward and adjust the back focus. Shoot an object at a distance of 30 m or more and adjust for the best possible sharpness. 2. Black mask tilt 1) Adjust VR204 (H. CENT) so that the black mask appears.

No.	Adjustment point	Adjustment
5	Focus and black mask tilt	2) Adjust so that the vidicon black mask becomes parallel to the vertical direction of the monitor screen. (See figure below.) Make this adjustment at the same time as the back focus adjustment. (See Fig. 3-7.) 3) After adjustment, tighten the tube clamp screw with a torque of about 1 kg-cm. 
6	Picture tilt Coil assembly (See Fig. 3-7.)	1) Loosen the picture tilt clamp screw (See Fig. 3-7.) 2) Rotate the coil assembly cylinder so that the picture becomes horizontal when both of the camera and the object are horizontal. 3) Tighten the clamp screw by the torque of 5 kg-cm.

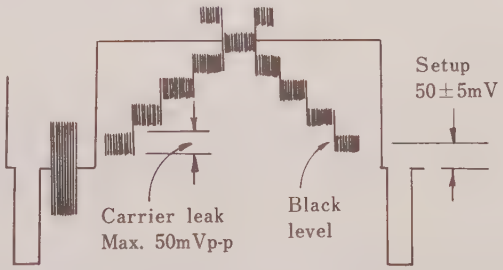
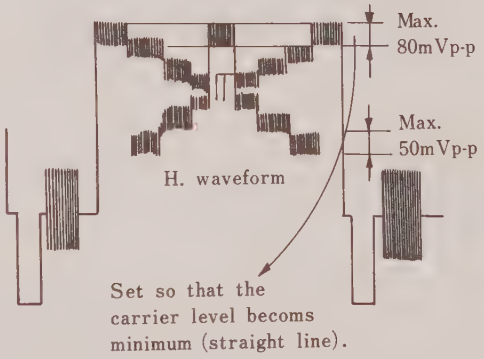
No.	Adjustment point	Adjustment
6	Picture tilt Coil assembly (Continued)	 Adjust the tilt within ±1°
7	Horizontal and vertical linearities VL201, VR209 (SYNC/DEF PCB)	* Use an underscan B/W monitor. 1. Shoot the EIA test chart A (Resolution Chart) and adjust VL201 (H. LIN) and VR209 (V.LIN) so that the center circle and the four surrounding circles become round on the monitor screen.  Set VL201 and VR209 so that the circles become round.
8	Horizontal size and horizontal center position	* Use an underscan B/W monitor. * Shoot the EIA test chart A (Resolution Chart). 1. Decrease the picture size with VL202 (WIDTH) and VR201 (HEIGHT) until the image edge appears.

No.	Adjustment point	Adjustment
8	Horizontal size and horizontal center position VL202, VR204 (SYNC/DEF PCB) (Continued)	2. Adjust the lens zoom so that the picture size is zoomed up roughly to the frame indicated by the 8 wedge markings. 3. Adjust VL202 and VR204 to position the chart wedges exactly on the frame of monitor screen. 4. Adjust VR204 so that the black mask period becomes 0.3 to 0.7 μs. (Connect an oscilloscope to pin 6 of CN205 and confirm the video output waveform.) The wedge markings on the right hand side must be exactly in touch with the right edge of raster. If not, adjust VL202. 
9	Vertical size and vertical center position VR201, VR202 (SYNC/DEF PCB)	* Shoot the EIA test chart A (Resolution Chart). 1. Adjust the picture height with VR201 so that the test chart is displayed fully on the screen. 2. Adjust the vertical position of the image with VR202 to position the upper and lower wedges of the chart in touch with the frame of monitor screen correctly.

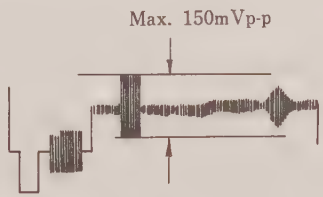
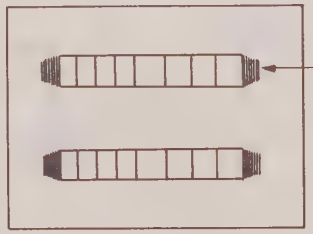
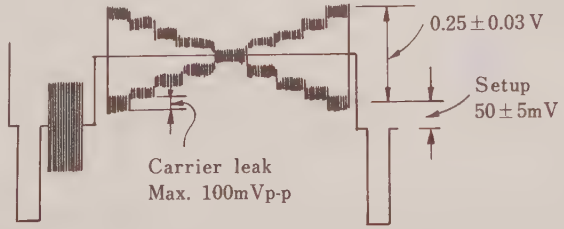
<table>
<tr><th>No.</th><th>Adjustment point</th><th>Adjustment</th></tr>
<tr><td>10</td><td>Vidicon dark current

VR112
(VIDEO PCB)</td><td>* Set the lens iris to close.
NOTE: This setting should be made after warming up for at least 10 min. after the power switch is turned ON.
Adjustment
Adjust the G ch preamp output level (TP4) by VR112 in accordance with the table in figure below, using an oscilloscope.

<table><tr><th>Ambient Temperature</th><th>Adjustment Value</th></tr><tr><td>10 - 19°C</td><td>60±5 mVp-p</td></tr><tr><td>20 - 29°C</td><td>80±5 mVp-p</td></tr><tr><td>30 - 39°C</td><td>100±5 mVp-p</td></tr></table></td></tr>
<tr><td>11</td><td>Black balance and setup</td><td>* Shoot the EIA test chart C (Logarithmic Reflectance Chart).
* Set the sensitivity switch to NORMAL.
* Set the lens iris to f/2.8.</td></tr>
</table>

No.	Adjustment point	Adjustment
11	Black balance and setup VR104, VR106, VR108 (VIDEO PCB)	Adjustment Adjust the setup level controls VR104, VR106 and VR108 so that the carrier leak can be a minimum and the setup level can be at 50±5 mV. 
12	White balance VR102, VR103 (VIDEO PCB)	* Shoot the EIA test chart C (Logarithmic Reflectance Chart). * Set the sensitivity switch to NORMAL. * Set the lens iris to f/4. * Turn the color temperature control (VR101) fully counterclockwise and return it about 45° in clockwise direction. Adjustment Adjust VR102 and VR103 so that the carrier wave becomes a minimum at the peak end of the video output waveform. 

No.	Adjustment point	Adjustment
13	R-Y balance and B-Y balance VR114, VR115 (VIDEO PCB)	* Shoot a fluorescent lamp or an incandescent lamp at a distance of 4 to 5 m. (Shoot a bright object and adjust the lens iris so that white clip is applied to the video level.) * Set the sensitivity switch to HIGH. * Set the lens iris to f/2. Adjustment 1. Turn VR114 and VR115 alternately so that the carrier of the white clip level portion becomes minimum. (Less than 50 mVp-p)
14	Crosstalk balance VR105, VR107 (VIDEO PCB)	* Shoot the EIA test chart C (Logarithmic Reflectance Chart). * Set the sensitivity switch to NORMAL. * Set the lens iris to f/4. Adjustment 1. Adjust VR105 and VR107 alternately so that the color blurring around the gray scales becomes a minimum. 2. Apply video signal to a band pass filter of 3.5 MHz ±0.5 MHz and adjust the video output to 150 mVp-p or less.

No.	Adjustment point	Adjustment
		  Monitor screen
15	Pulse canceller VR109, VR110, VR111 (VIDEO PCB)	* Shoot the EIA test chart C (Logarithmic Reflectance Chart). Adjustment 1. 1) Set the sensitivity switch to HIGH. 2) Set the lens iris to f/16. 3) Adjust VR109, VR110 and VR111 so that the carrier leak becomes minimum.  Note: Confirm that the setup is 50±5 mV. 2. 1) Set the sensitivity switch to NORMAL. 2) Set the lens iris to f/2.8. 3) Adjust VR109, VR110 and VR111 so that the carrier leak becomes minimum.

No.	Adjustment point	Adjustment
16	AGC VR113 (VIDEO PCB)	* Shoot the EIA test chart C (Logarithmic Reflectance Chart). * Set the sensitivity switch to NORMAL. * Adjust the lens iris so that the video output level becomes 0.44 ±0.02 Vp-p. Adjustment Set VR113 where the indicator (L) just starts to light. NOTE: Confirm that the video output level is 0.7 ±0.07 Vp-p when the sensitivity switch is set to HIGH after the above adjustment.
17	White balance meter VR501 (SUB PCB)	1. Close the lens iris and adjust VR501 so that the white balance meter indicates the center. NOTE: Prior to this adjustment, confirm that the black balance adjustment has been completed.

3.5 Disassemblying the electronic viewfinder GM-2B

1. Remove the bottom shield case by removing the three screws.

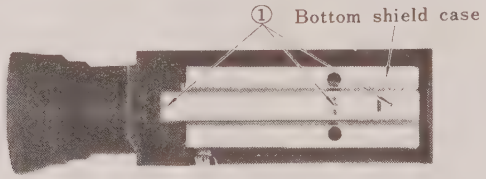


Fig. 3-8

2. Remove the CRT assembly (with PC board) from the top cover. (Remove the four screws ② .)

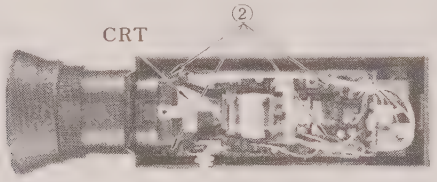


Fig. 3-9

3. Remove the CRT shocket and anode cap. Remove the CRT assembly from the PC board. (Remove the three screws ③ .)

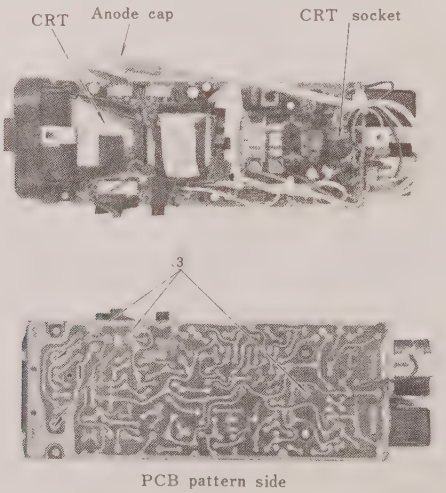


Fig. 3-10

4. Remove the shadow mask, and loosen the CRT setscrew and the deflection yoke setscrew. Then, draw out the CRT.
5. Take the reverse steps 5 through 1 for assemblying.

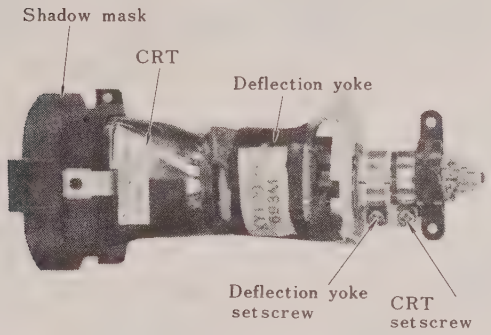


Fig. 3-11

4. CIRCUIT DESCRIPTION

4.1 Video PCB

The video PC board contains of the video circuits (preamplifier circuit, process amplifier circuit, Y-matrix, aperture circuit, color difference amplifier circuit, ASC (AGC) circuit), VTR trigger circuit, level indicator circuit, and sound amplifier circuit.

4-1-1 Video circuit

The video circuit amplifies the R, G, and B signals from the pickup tube and produces Y-signal and color difference signal (R-Y and B-Y signal). The block diagram of the video signal is shown in Fig. 4-1.

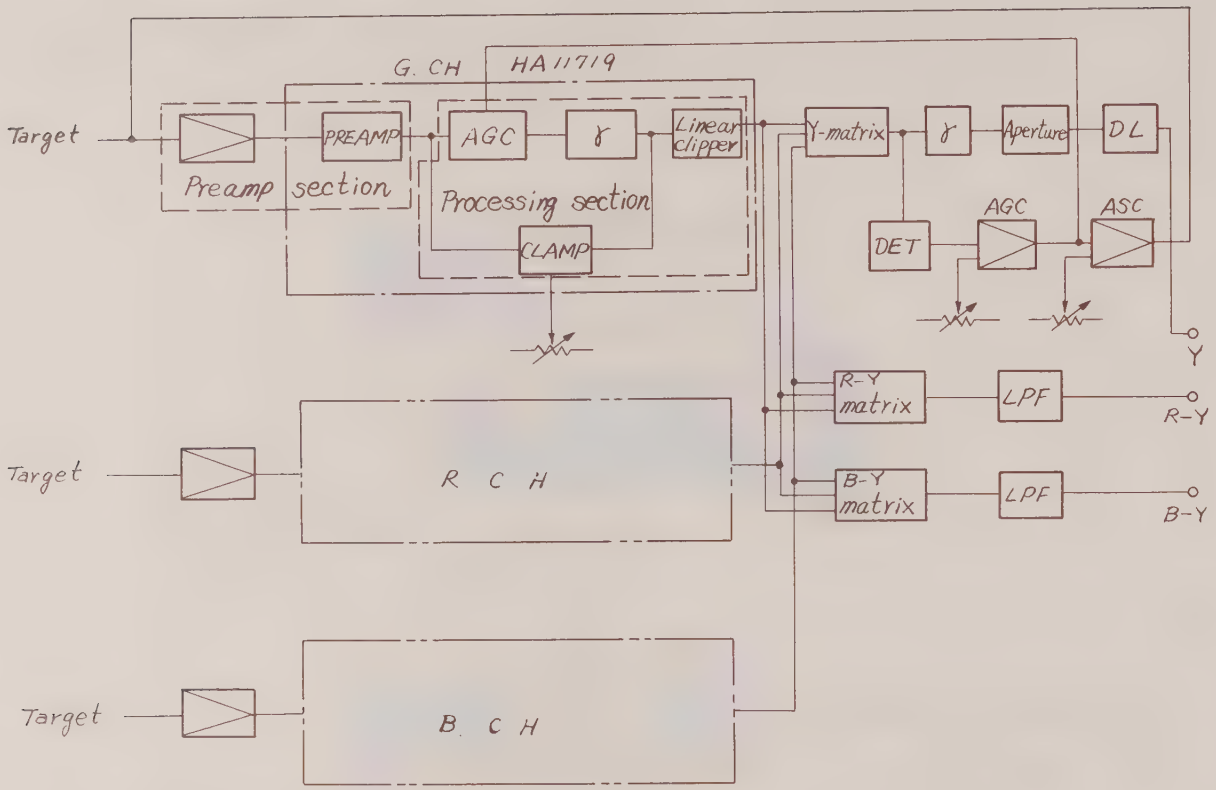


Fig. 4-1 Video system block diagram

1) Preamplifier circuit

The preamplifier functions to amplify a small signal from a vidicon. As the signal from the vidicon is considered to be a noise-free constant current power supply. As the value per electrode is about 30 nA, the S/N of the entire camera is decided by the preamplifier.

For this reason, an FET with an excellent noise figure is carefully selected for the first stage, and the gate resistance is made as large as 1 MΩ to reduce the influence of the resistance noise. As a band of about 3 MHz is required for the video signal band, sufficient NFB was applied to lower the apparent input impedance of the preamplifier to about 1 kΩ. The ratio of the green, red,

and yellow video signals from the vidicon differs according to color temperature and the characteristics of vidicon even when the same white subject is televised. For this reason, the resistance of the NFB loop is variable, and it is adjusted so that the ratio of the three preamplifier outputs becomes 1:1:1 when a white subject is picked up. A, rated video signal of 0.5 Vp-p is obtained as pre-amplifier output.

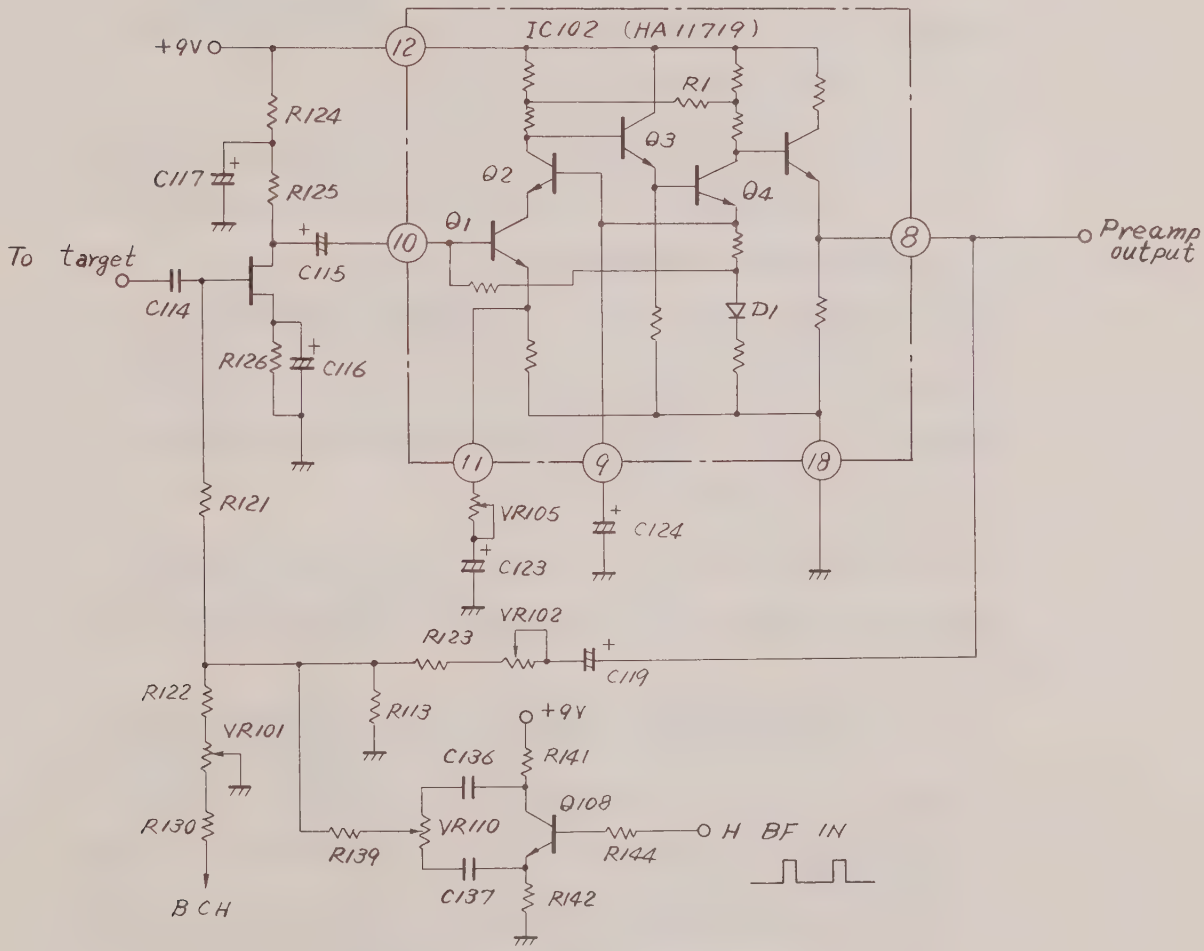


Fig. 4-2 Preamplifier circuit

Fig. 4-2 shows the preamplifier circuit. Basically, it is a emitter grounding type direct coupling 2-stage amplifier consisting of Q1 and Q2. Q2 is in cascade connection with Q1 to reduce the mirror effect of Q1, Q3 reduces the drive impedance of Q4. Thus the frequency characteristic is improved.

R1 is a parallel feedback resistor and the frequency characteristic is improved by the feedback amount of about 10 dB.

VR105 is a control for the input impedance, and it is adjusted so that streaking does not appear on the black and white edges when a gray scal e chart is picked up.

VR102 is a gain control. VR101 is a color temperature control and according to the use conditions it is recommended to be adjusted so that the white balance meter indicates the center position when a white or gray object is picked up.

VR110 is a pulse cancel control. It cancels the synchronous noise in the clamp pulse time, and it is adjusted so that the clamp level does not change between the normal gain and the high gain (AGC ON). An HBF pulse is applied to the preamplifier input for the above mentioned pulse cancel pulse.

2) Process circuit

The process circuit is a portion of the IC (HA11719) and consists of AGC circuit gamma circuit, linear clip circuit and clamp circuit.

2)-a. AGC circuit

The video signal from the preamplifier is maintained constant by the ASC circuit when the brightness of the object changes. However, with decreasing brightness of the object, the ASC circuit ceases to function, and finally the video signal from the preamplifier decreases.

Here the process output signal can be maintained constant for a further change of the light volume up to about two times by detection of the Y signal and controlling the AGC (13 pin).

The AGC gain is decided by the 13 pin voltage in regard to the

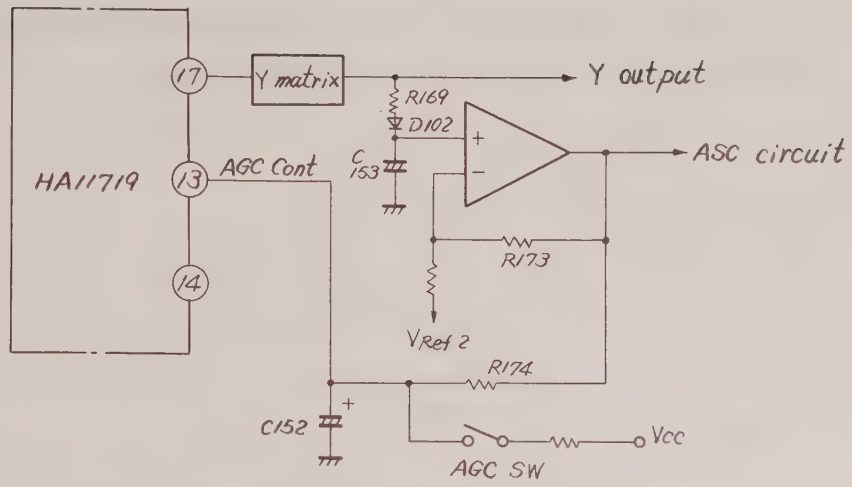


Fig. 4-3 Peripheral circuit of AGC

14 pin voltage (3.5 V), and when the 13 pin voltage is lowered, the AGC gain increases. When AGC is not required, the 13 pin is connected to Vcc by means of the AGC switch.

Fig. 4-3 shows the peripheral circuit of the AGC. Fig. 4-4 shows the change of the gain in regard to the AGC voltage.

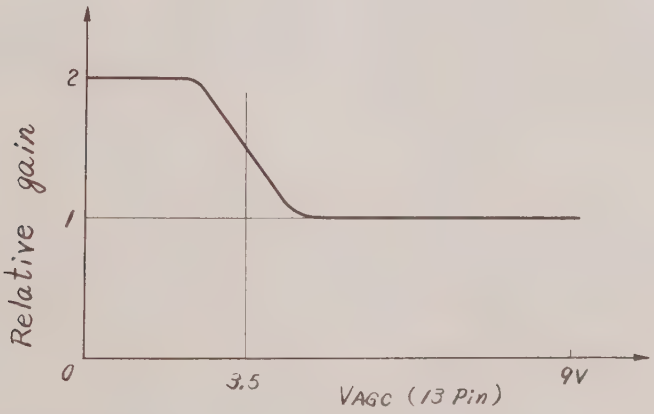


Fig. 4-4 AGC characteristic

One part of the input signal from the emitter of Q2 passes through R1 and drives Q5, while the other part passes through R2 and

drives Q8. These drive currents are switched and mixed by Q3, Q4, Q6, and Q7 and flow to R3 (AGC output).

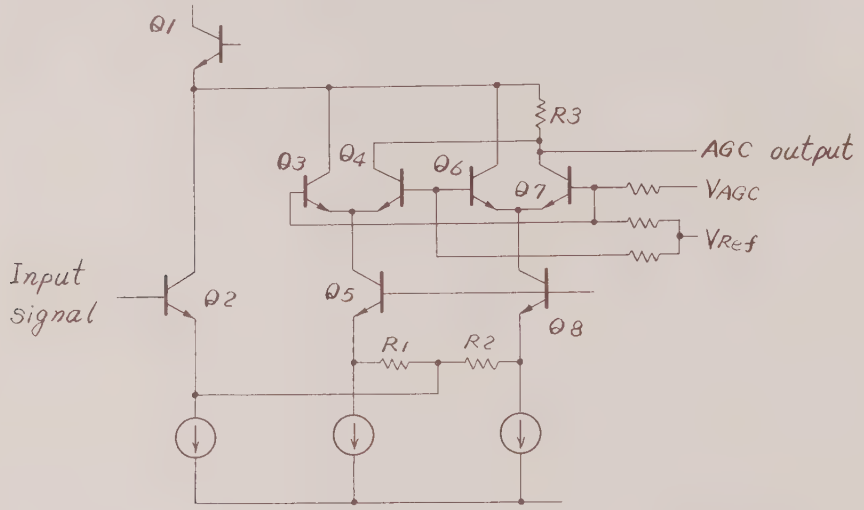


Fig. 4-5 Basic AGC circuit

2)-b. Gamma circuit

A television camera requires a gamma correction circuit to correct the gamma ($\gamma \fallingdotseq 2.2$) of a picture tube. The gamma value differs according to the pickup tube used in the camera. The gamma is set to 0.7 for vidicon tube, while it is set to 0.45 for Saticon* tube.

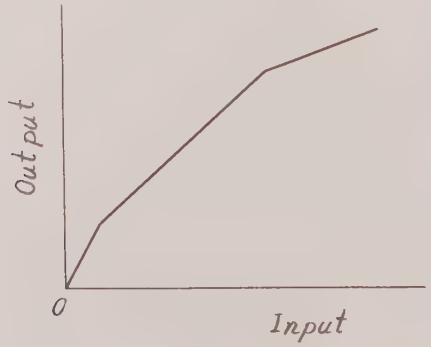


Fig. 4-6 Gamma correction curve

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* SATICON サチコン (Trade mark)

2)-c. Linear clip circuit

Because of the deflection pulse, etc., large synchronous noise is superimposed on the video signal obtained from the preamplifier during the blanking period. Also, when the video signal becomes large, it may exceed the rated level. The linear clip circuit serves to make the video signal during the blanking period pure and to clip the video signal to the rated level. The operation is shown in Fig. 4-7. When the blanking signal is applied to the 2 pin input, it is mixed with the input video signal, and simultaneously white clipping is achieved at the H level of the blanking signal. The black clip level is decided by DC potential at the 14 pin.

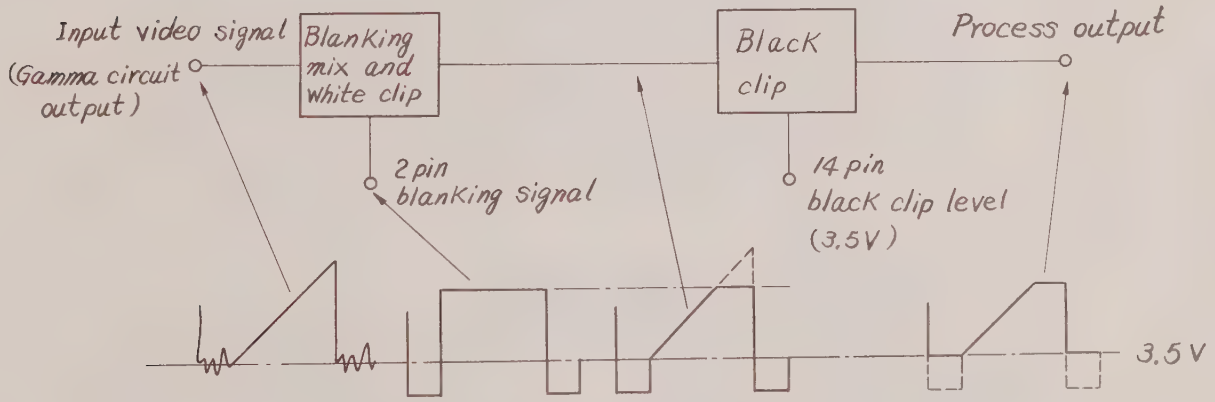


Fig. 4-7 Linear clip operation

The blanking signal is mixed to the input video signal at Q1 and Q2. White clip is achieved by setting the H level of the blinking signal.

Q3 and Q4 clip the video signal mixed with the blanking signal to a fixed black level. This output is the final output signal (17 pin). Fig. 4-8 shows the basic circuit.

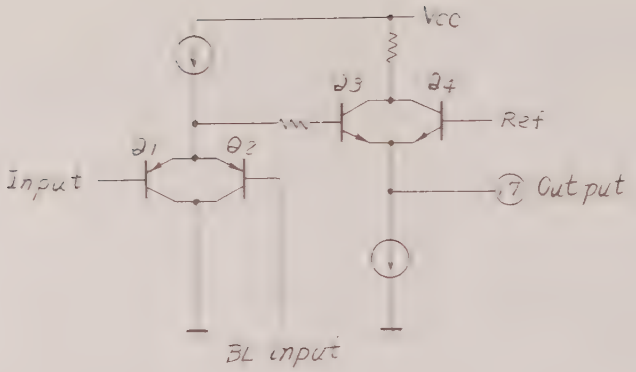


Fig. 4-8 Basic linear clip circuit

2)-d. Clamp circuit

When achieving the gamma correction and linear clip, the black level which serves as a reference must be DC fixed. The DC fixing of the black level is achieved by clamping the AGC input signal. The outline of the feedback clamp is shown in Fig. 4-9. When a gate pulse (GP) is supplied, the gamma output voltage is sampled by Q203 and Q218 and it is held by capacitor C1. The

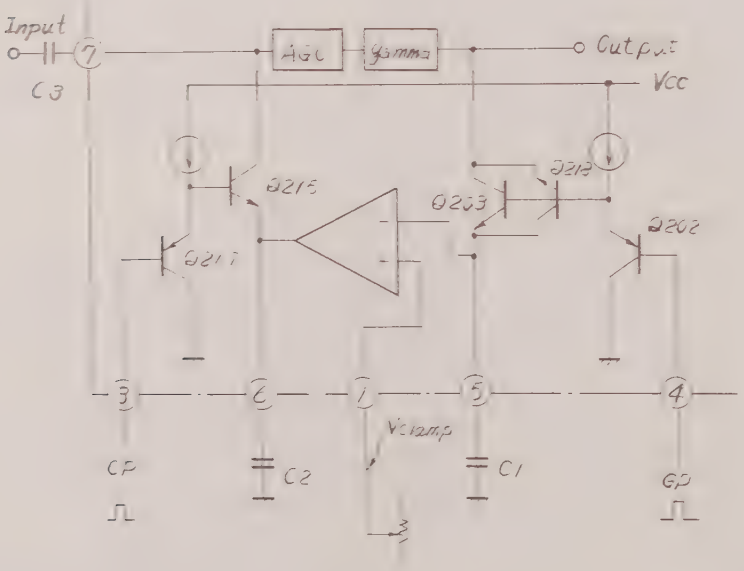


Fig. 4-9 Outline for feedback clamp

hold voltage of C1 is compared with the clamp voltage (V_{CL}) and amplified. Then it is charged to C2. When the clamp pulse (CP) is added, Q215 is conductive, and the black level of the input signal is clamped to the voltage of C2.

3) Y matrix, aperture circuit

The R, G, and B output signals supplied from the respective process circuits are added by the matrix resistors R146, 147, and 148 and the luminance signal is produced. Then, gamma correction is made by Q112.

Next, contour compensation is made by the aperture circuit of Q113, 114, and DL101. After amplification, Y signal is delayed by DL 102 to match the phase with the chroma phase, and then the signal is supplied to the SYNC/DEF PC board. About 1 μs delay is made by DL101 and DL102.

The rated Y signal output is 1.5 Vp-p.

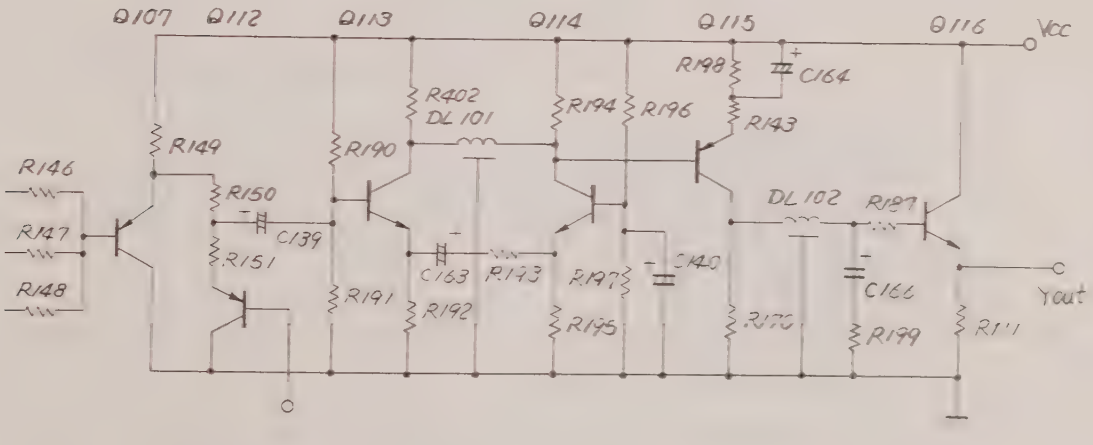


Fig. 4-10 Y matrix, aperture circuit

The frequency characteristic of the aperture circuit is shown is Fig. 4-11.

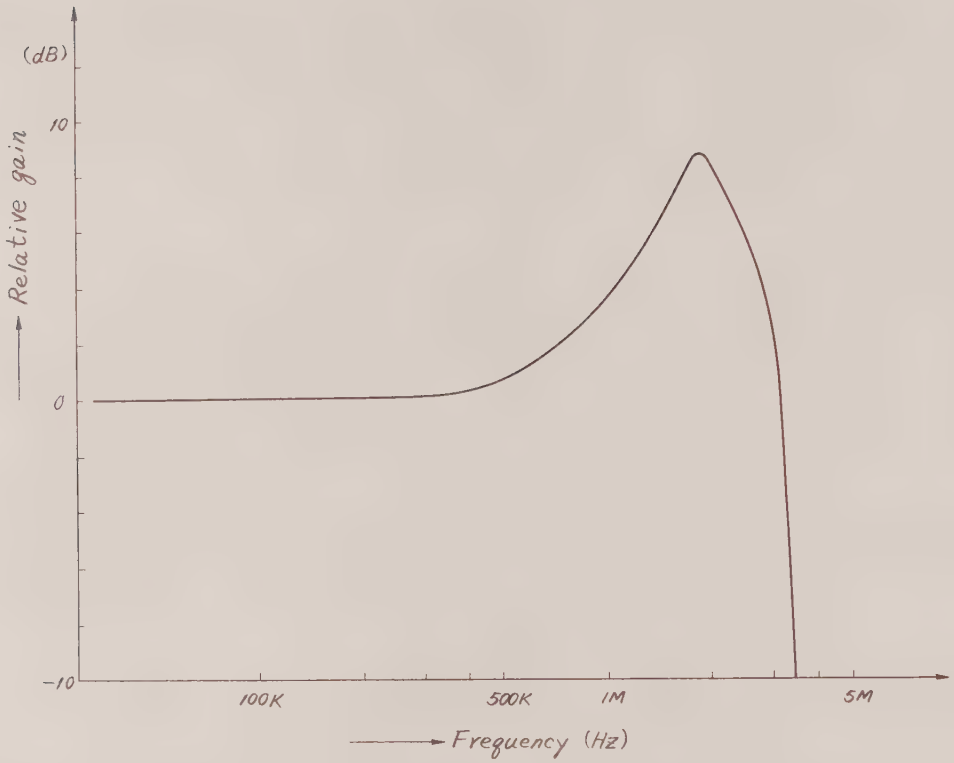


Fig. 4-11 Aperture circuit frequency characteristic

4) Color difference signal amplifier circuits

These circuits produce the color difference signals, R-Y and B-Y, from the R, G, and B signals. The both circuits are contained in IC105 (ZC-0226).

The operation is the same for both circuits, and it will be explained for the R-Y circuit.

As Q1 operates as emitter ground with respect to the G signal supplied via VR114 and R153 and the B signal supplied via R155, these signals appear with their phases inverted at the collector of Q1. On the other hand, Q1 operates as the base ground with respect to the R signal supplied to the emitter via R154. Therefore, it appears with the same phase at the collector.

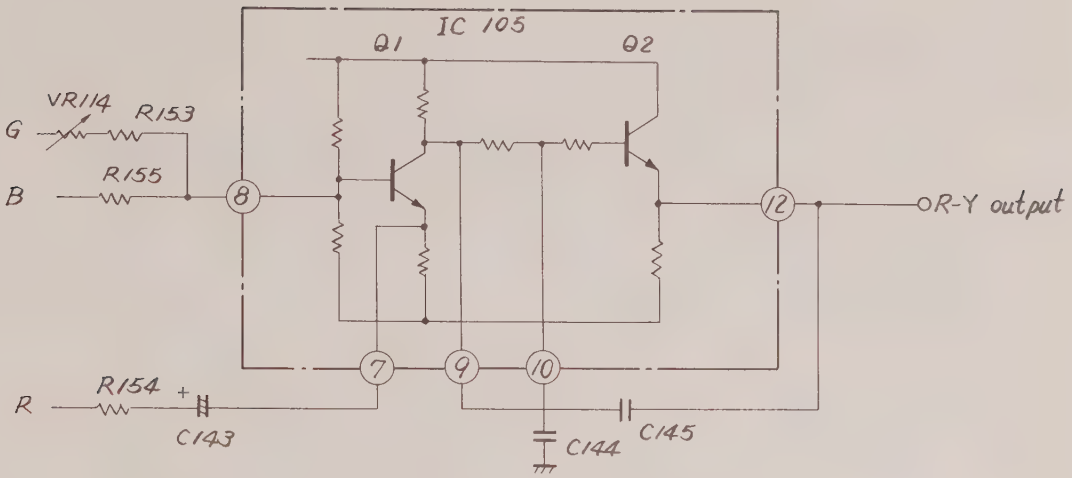


Fig. 4-12 Color difference signal amplifier circuit

When a white object is picked up, the RGB signals become equal and cancel each other. Therefore, no output signal appears. VR114 is provided to obtain this balance.

Afterwards, the Q1 output signal passes a low pass filter and becomes the R-Y output signal.

5) ASC (AGC) circuit

The ASC circuit controls the vidicon target voltage so that the video signal does not exceed the specified level with a sufficient amount of incident light, and maintains a fixed video level.

A part of the ASC circuit is used in common with the AGC circuit, and the operation range with respect to the light amount is shown in Fig. 4-13.

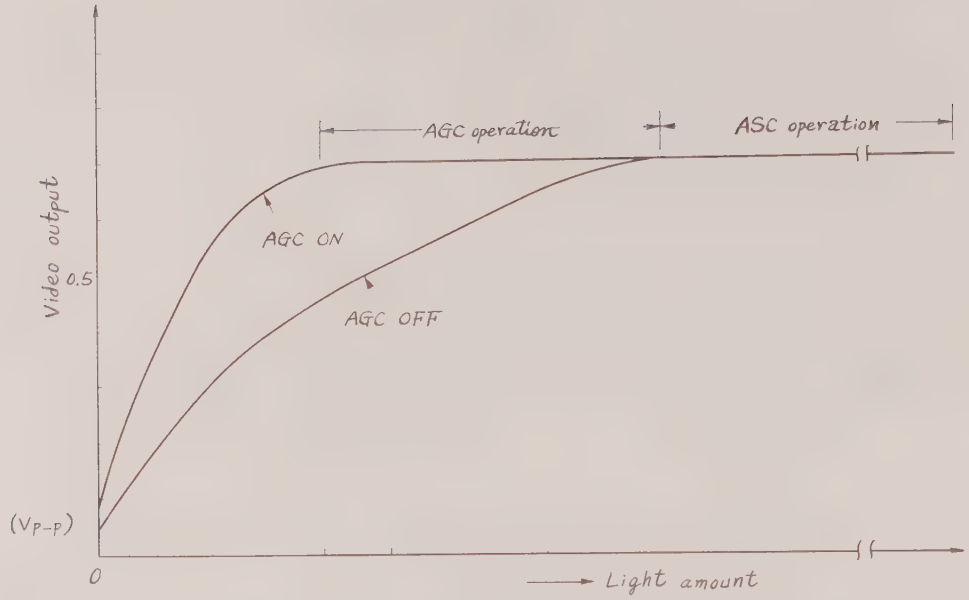


Fig. 4-13 AGC, ASC characteristic

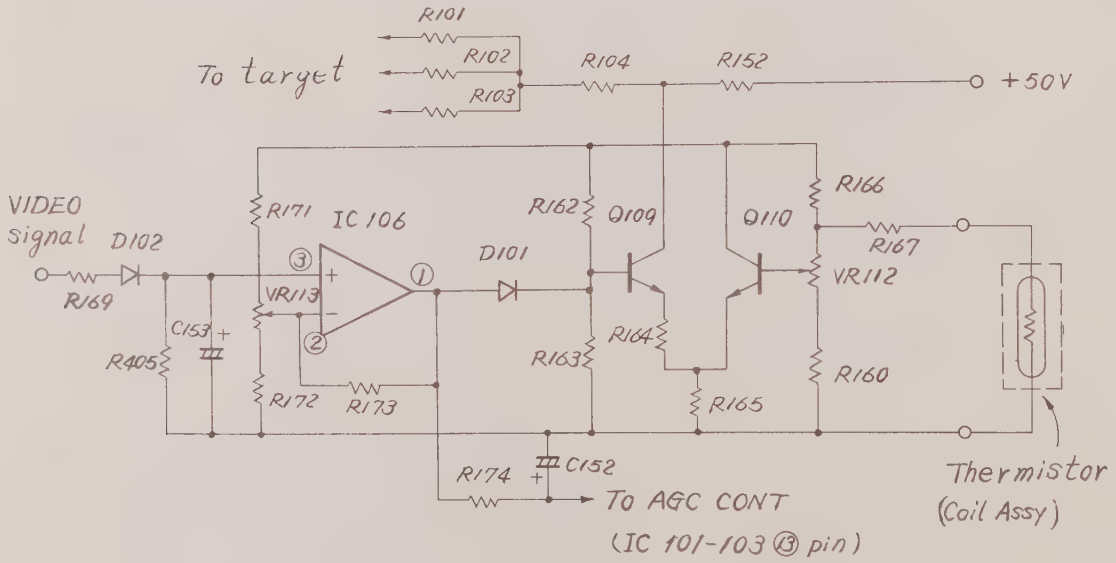


Fig. 4-14 ASC (AGC circuit)

Peak value rectification is performed for the video signal by D102, and a voltage proportional to the magnitude of the signal is charged by C 153. When this voltage becomes larger/smaller than the level set by VR113, the current flowing to Q109 decreases/increases, and the target voltage increases/decreases. When the target voltage increases/decreases, the signal current increases/decreases, so that the voltage of C153 increases/decreases, and balance is reached at the set level (AGC set level).

When the light amount decreases still further, the output voltage of IC106 (1) pin decreases, D101 becomes reversed bias, and the target voltage does not increase beyond this point. Since the AGC control voltages at (13) pin of IC101 to 103 decrease, the AGC circuit starts to operate and the signal levels are increased. Thus, the signals are balanced at the AGC set level.

Set VR113 so that a VIDEO output becomes 0.7Vp-p when the AGC switch is set to ON and the lens of F 2.8 is used under the standard illumination.

Q110 functions to correct the temperature characteristic of the dark current of the pickup tube.

In case of vidicon, an unnecessary dark current flows even without incident light, just as if there were incident light.

This dark current becomes extremely large when the target voltage is high or when the ambient temperature is high, and the picture quality is impaired considerably.

This circuit controls the target voltage so that the dark current is constant independent of the ambient temperature when an incident light is little. The largest dark current flows when there is little incoming light, the video level is decreased, and D101 is reverse bias. The target voltage is controlled by controlling the current of Q109 by Q110 so that the dark current becomes constant.

TH1 is the thermistor for temperature compensation and installed in a coil assembly to detect the temperature of the pickup tube.

VR112 is a control which decides the max. value of the dark current.

4-1-2 VTR trigger circuit

IC108 (ZC-0227) operates as this circuit. The internal circuits of the IC and its peripheral circuits are shown in Fig. 3-16.

When Q1 is and Q2 OFF flipflop Q1, Q2 is the reset condition. When the power supply is switched on, the flip-flop always is in reset condition, and it is reversed each time when the remote control switch (non-locking type) is pressed. When the flip-flop is in the reset condition, the VTR is in the STOP mode, while the VTR is in the operation mode when the flip-flop is in the set condition.

Accordingly, VTR repeats the start and stop modes each time when the remote control switch is pressed. In VTR operation condition, the letter "V" in the finder is lit and the operation can be confirmed.

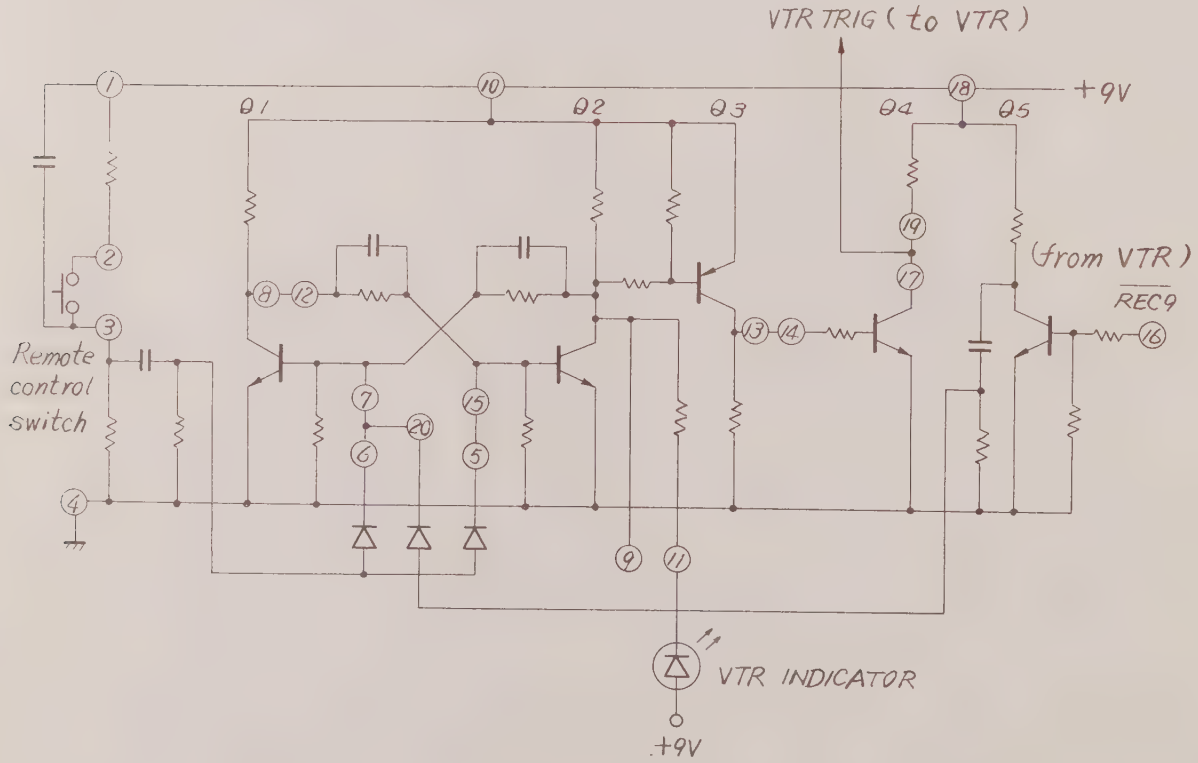


Fig. 4-15 VTR trigger circuit

4-1-3 Level indicator circuit

This circuit indicates insufficient light amount when the video output level drops to 90% or less of the rated level (about 0.7 Vp-p), and this indication is made by the operation amplifier as shown in Fig. 4-16.

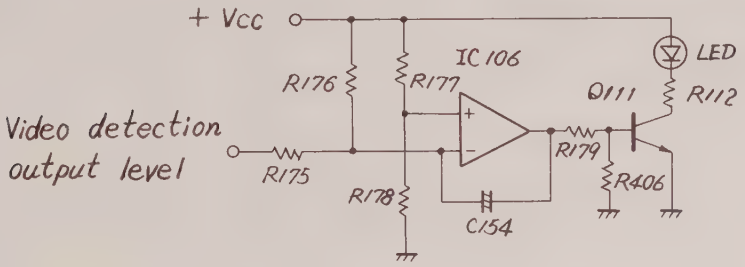


Fig. 4-16 Level indicator circuit

When the video output level drops to 90% or less of the rated level, the letter "L" is lit in the finder for operation confirmation.

4-1-4 Sound amplifier circuit

The sound amplifier circuit amplifies the sound signal from the microphone and supplies it to the VTR. This circuit consists of an IC107 (TA7120).

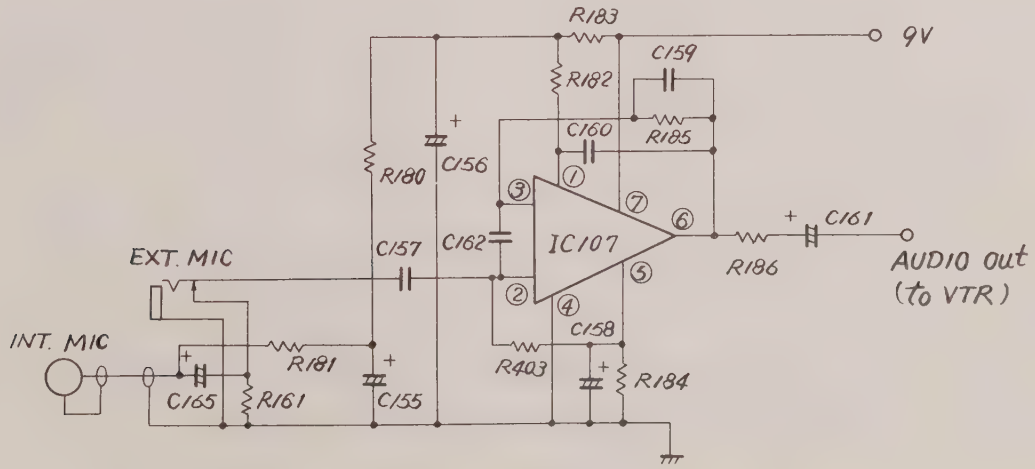


Fig. 4-17 Sound amplifier circuit

The amplification of the entire amplifier is 45 dB and an output of -20 dB is obtained by using a -65 dB microphone.

4.2 Sync/def PCB (NTSC)

The SYNC/DEF board contains the SYNC generator circuit, the color modulator, video output circuit, the horizontal deflection circuit, the vertical deflection circuit, the regulated power supply circuit, the battery indicator circuit, and the return sound circuit.

4-2-1 SYNC circuit (NTSC)

The SYNC circuit of GP-4 is composed of a CMOS IC (HD440071). This is a dual in line 28 pin plastic mould type IC operating with +7V.

Figs. 4-18 and 4-19 show the schematic diagram and the block diagram of HD440071.

Section A is a crystal oscillator using a CMOS inverter, and it oscillates at the frequency of 14.31818 MHz, four times the subcarrier frequency. This oscillation frequency becomes the subcarrier after 1/4 frequency division. Further, the phases of the output signal obtained by dividing the output signal frequency by 161 and the output signal obtained by dividing the VCO output frequency by 184 are compared. The output of this comparator is rectified by the low-pass filter of section C and the resultant DC controls the VCO of section B. This is the so-called PLL circuit. By this PLL operation, the VCO oscillation frequency of part B becomes 260 times the horizontal frequency. This frequency is divided by 2 and is supplied to the PULSE FORMER as a clock pulse to obtain HD, VD, SYNC, etc. Section D is the power supply circuit for HD440071. Q215 composes a series regulator, and the +9V input is converted to +7V. IC202 is the pulse polarity inverter or the CMOS inverter operating as buffer.

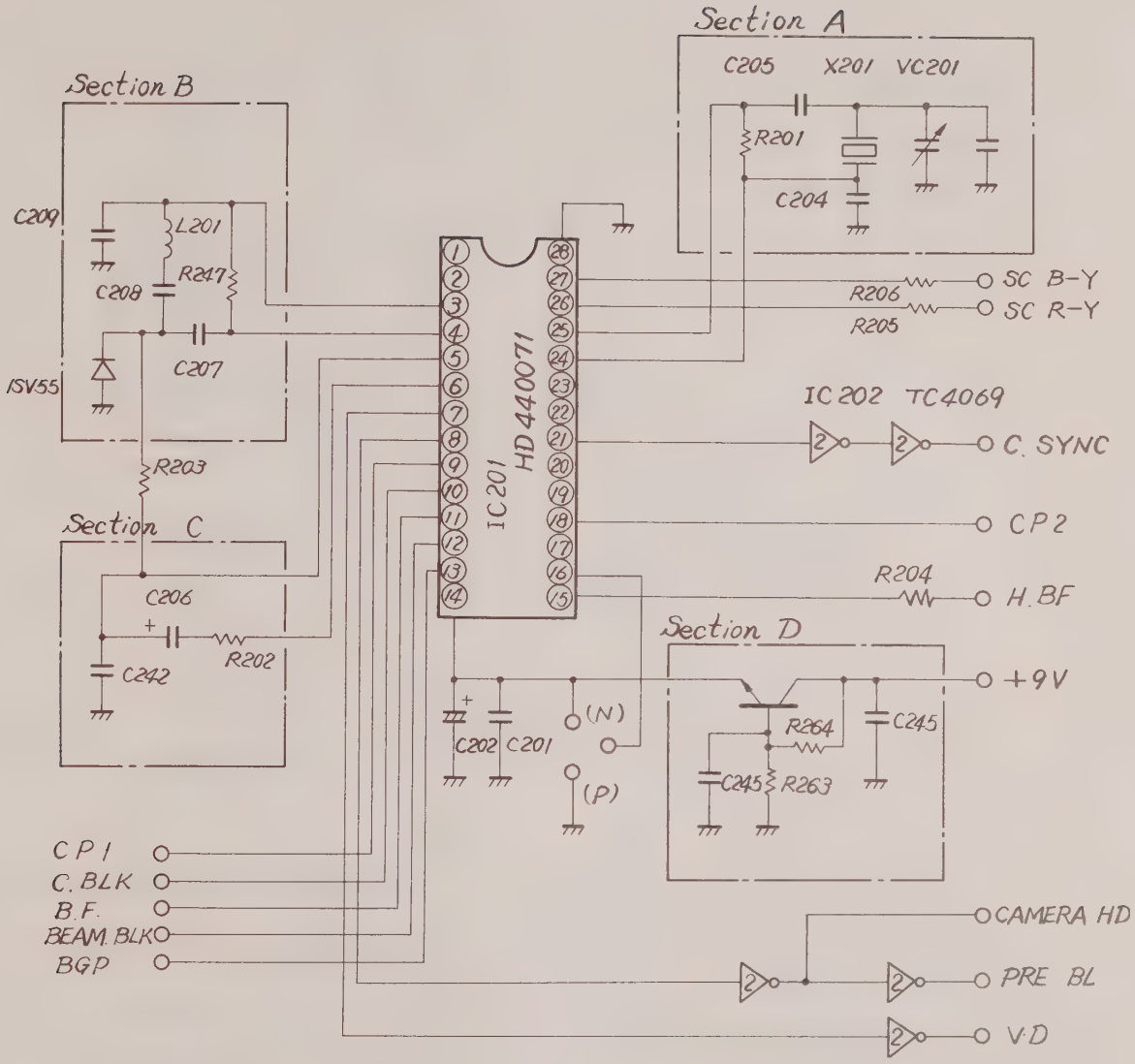


Fig. 4-18 Circuit diagram

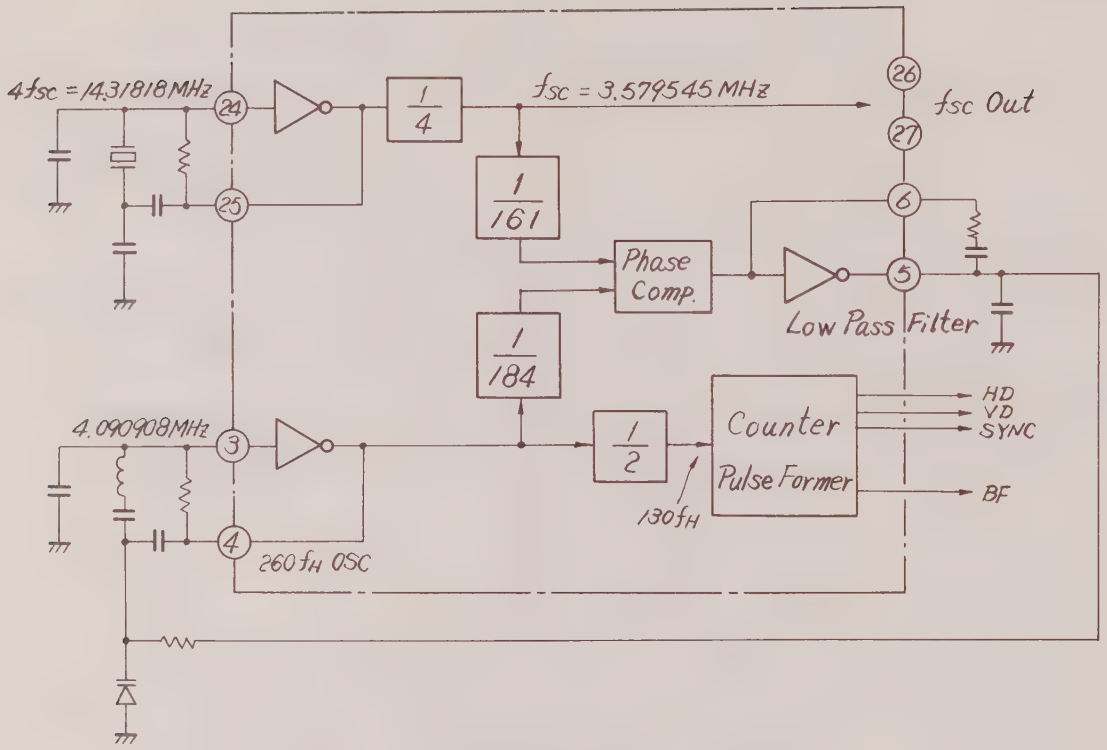


Fig. 4-19 HD440071 block diagram

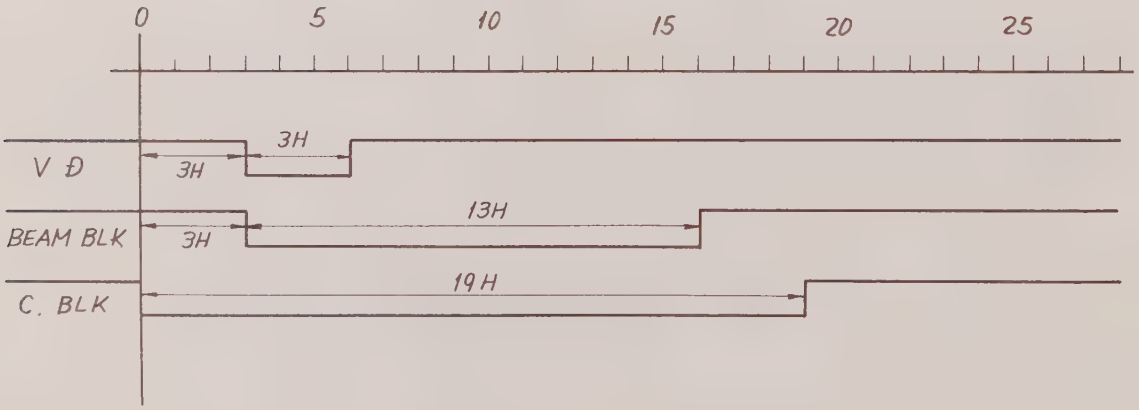


Fig. 4-20 Operation timing chart (V)

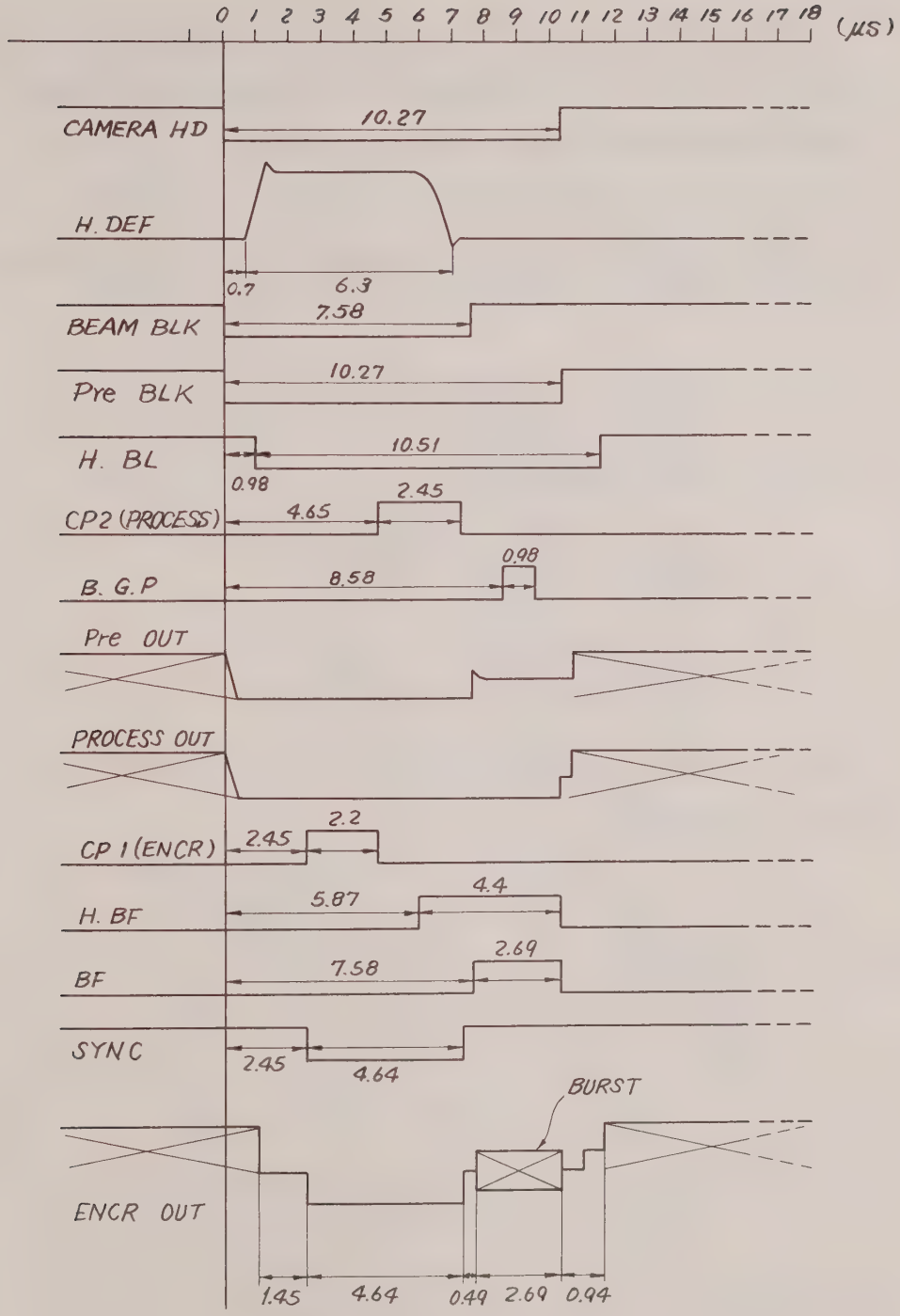


Fig. 4-21 Operation timing chart (H)

4-2-2 Color modulation, video output circuit

This circuit converts the Y signal and the color difference signals (R-Y and B-Y) from the VIDEO PC board into the NTSC signal. The block diagram is shown in Fig. 4-22.

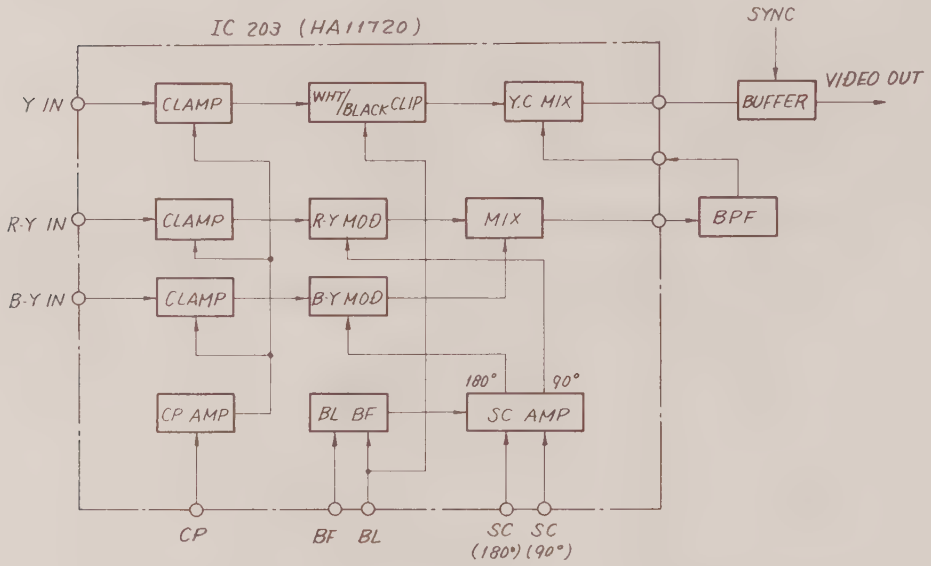


Fig. 4-22 Color modulation, video output circuit block diagram

1) Video output circuit

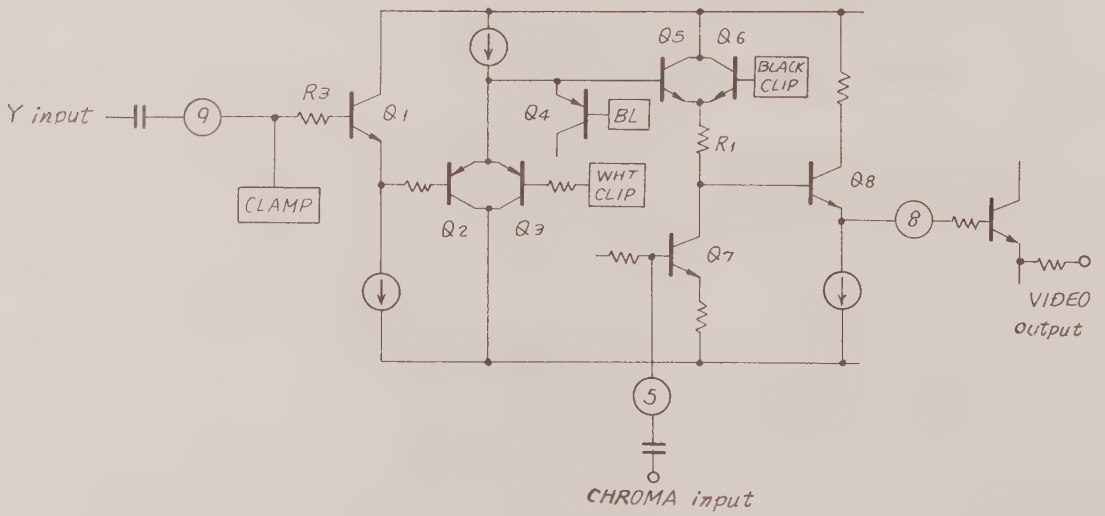


Fig. 4-23 Video amplifier

The Y signal is clamped at the input stage and its DC level is fixed. White clipping and blanking mixing are made at Q2-Q4. The Y signal is then black clipped by Q5 and Q6 and becomes the output via R1 and Q8. On the other hand, the chroma signal is amplified by Q72 and mixed with the Y signal. Though white clip and black clip can be adjusted from the external terminals, they operate by means of the internal bias voltage when they are open with respect to DC.

2) BL and BF mixing circuit

As the BL (blanking) pulse maintains the base of Q1 at a constant current potential, the level is limited by Q1 and Q2. In the similar fashion the level of the BF (burst flag) signal is limited by Q7 and Q8. These two signals are mixed by Q3 and Q4.

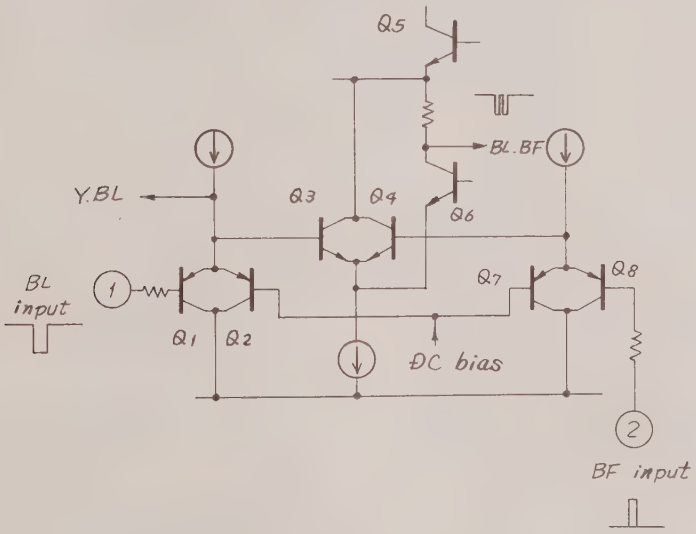


Fig. 4-24 BL and BF mixing circuit

This signal is DC-shifted by Q6 and is supplied to the SC amplifier circuit, where the subcarrier signal is gated.

3) SC amplifier circuit

When the subcarrier is applied to the base of Q3, which forms a

differential amplifier together with Q4, then subcarrier signals with mutually reverse polarity are obtained at the collectors of Q3 and Q4. The DC offset of the output is specified by Q2.
Q5 and Q6 are operated and Q3 and Q4 are cut off in order to stop the subcarrier output during the blanking period except for the burst flag period.
This subcarrier amplifier has two systems, one for the B-Y axis and one for the R-Y axis.

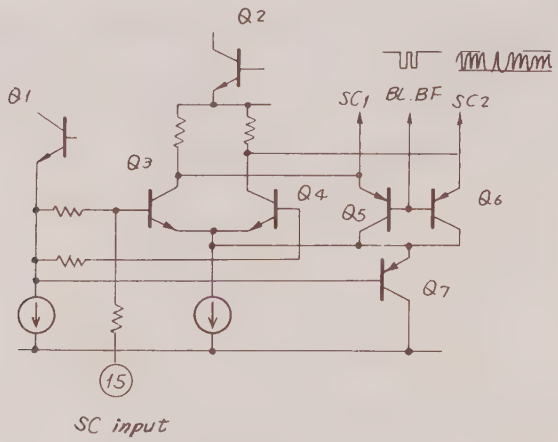


Fig. 4-25 SC amplification circuit

4) Modulation circuit

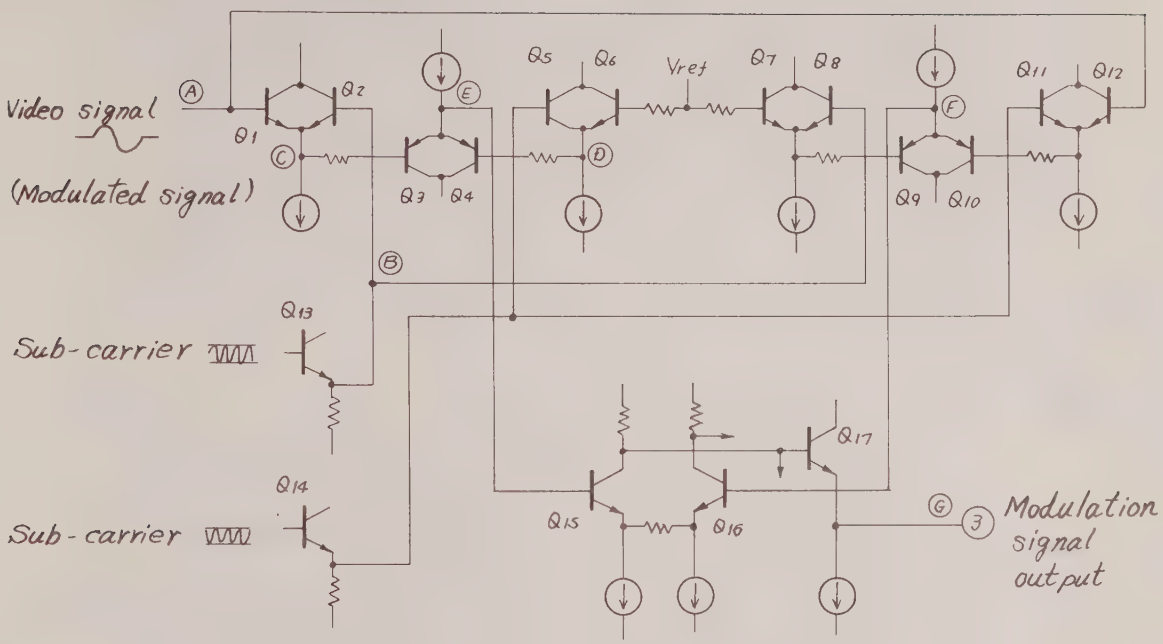


Fig. 4-26 Modulation circuit

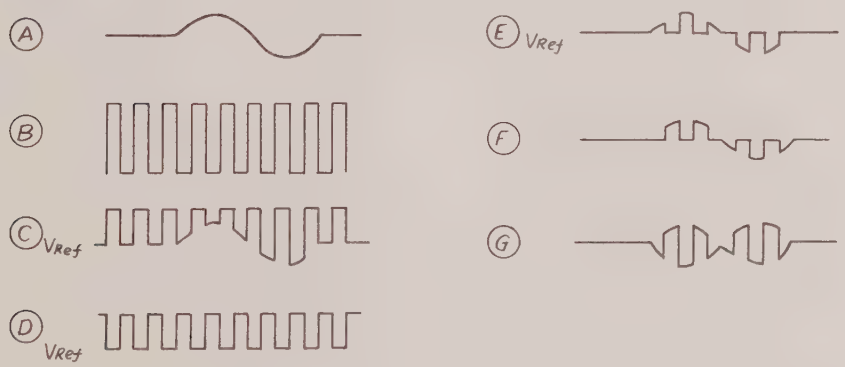


Fig. 4-27

Fig. 4-26 shows the circuit of the modulation part, and Fig. 4-27 shows the waveforms at the points (A) to (G). When the video signal (A) is applied to the base of Q1 and the subcarrier (B) is applied to the base of Q2, the signal shown by (C) is obtained at the common emitter. When the reference DC voltage is applied

to the base of Q6 and the subcarrier is applied to the base of Q5, the carrier shown in (D) with a phase shifted by 180° from (C) is obtained at the common emitter. When these signals are applied to Q3 and Q4, the signal shown in (E) is obtained. In the same way, the modulation waveform (F) is obtained at the common emitter of Q9 and Q10. These signals are amplified by the differential amplifier consisting of Q15 and Q16 and the same phase components are suppressed. Thus, the balanced modulation signal shown in (G) is obtained. The above operations are performed for the B-Y axis and for the R-Y axis.

4-2-3 Horizontal deflection circuit

The main functions of this circuit are horizontal deflection and electrode voltage generation. The operation is almost the same as for the horizontal deflection circuit of a television receiver, and it should be thought of as one of small scale.

The horizontal deflection transistor Q208 is driven by pulses as shown in Fig. 4-28, and a flyback pulse of about 150 Vp-p and about 6 μs width is obtained at the collector of Q208. This pulse is supplied to the horizontal deflection coil via the horizontal size coil VL-202 and the horizontal linearity coil VL-201. VR204 is a horizontal centering control. The horizontal deflection position is a adjusted by superimposing a DC current onto the horizontal deflection current. Also, the flyback pulse is rectified and used as power supply for cathode blanking and as target voltage. The flyback pulse is boosted by T201 and rectified by D208. DC 500 V

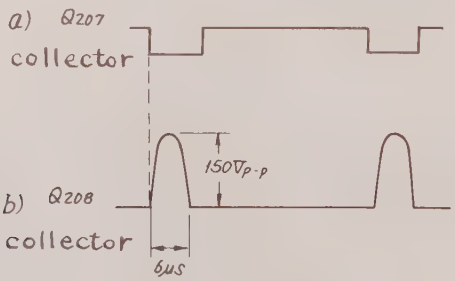


Fig. 4-28

is supplied to G6, and DC 300 V from the varistor D209 is regulated and supplied to G2. DC -100 V is rectified by D207 and supplied as the G1 voltage. The G1 voltage is adjusted by VR206 to the optimum value. When beam is insufficient, bright portions are suppressed and trailing appears when camera is moved. On the other hand, when beam is excessive, focus blurs and a picture will rotate.

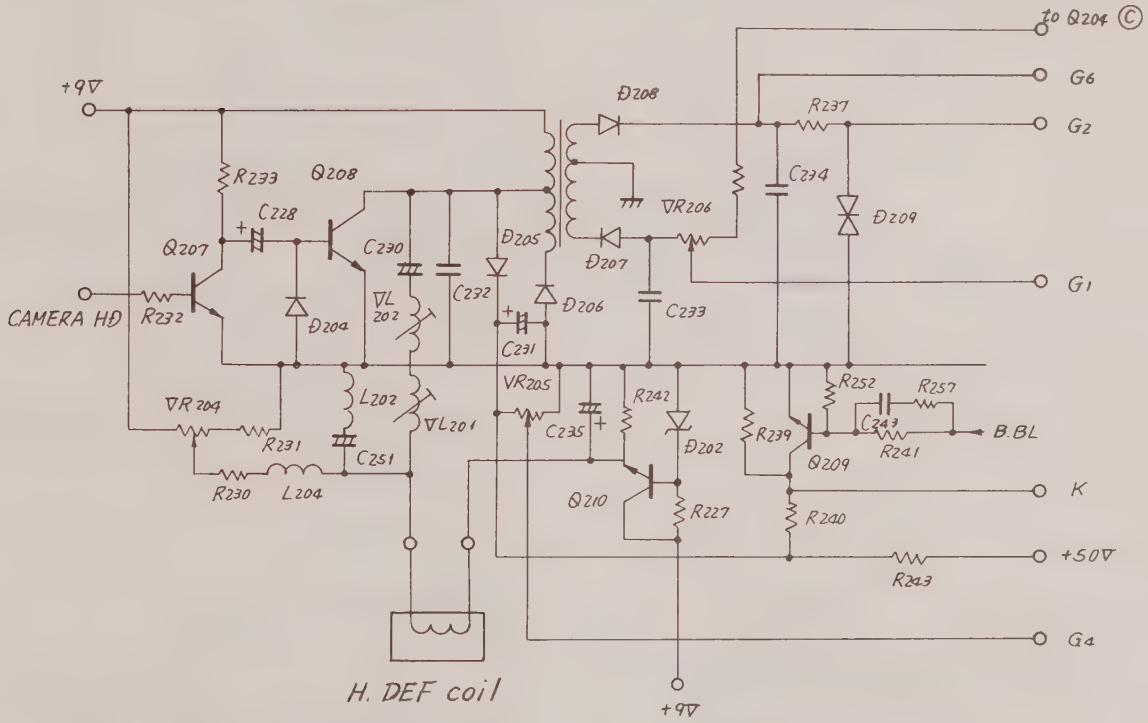


Fig. 4-29 Horizontal deflection circuit

4-2-4 Vertical deflection circuit

When a positive VD pulse is applied to Q202, a sawtooth voltage is generated by the integration circuit of R217 and C216 from repeated ON-OFF of Q202.

IC204 is a power IC for amplification of the sawtooth to the constant power output. Q204 becomes ON with the vertical deflection output

pulse and OFF without vertical deflection output, and it cuts off the G1 voltage of the pickup tube for protection of the pickup tube. VR201 is a HEIGHT control for adjustment of the vertical amplitude. VR204 is a V.LIN control for adjustment of the vertical linearity. VR202 is a V.CENT control for adjustment of the vertical position. The output current from pin (6) of IC204 is negative fed back to pin 3 through the vertical deflection coil and the deflection coil is drives by the constant current.

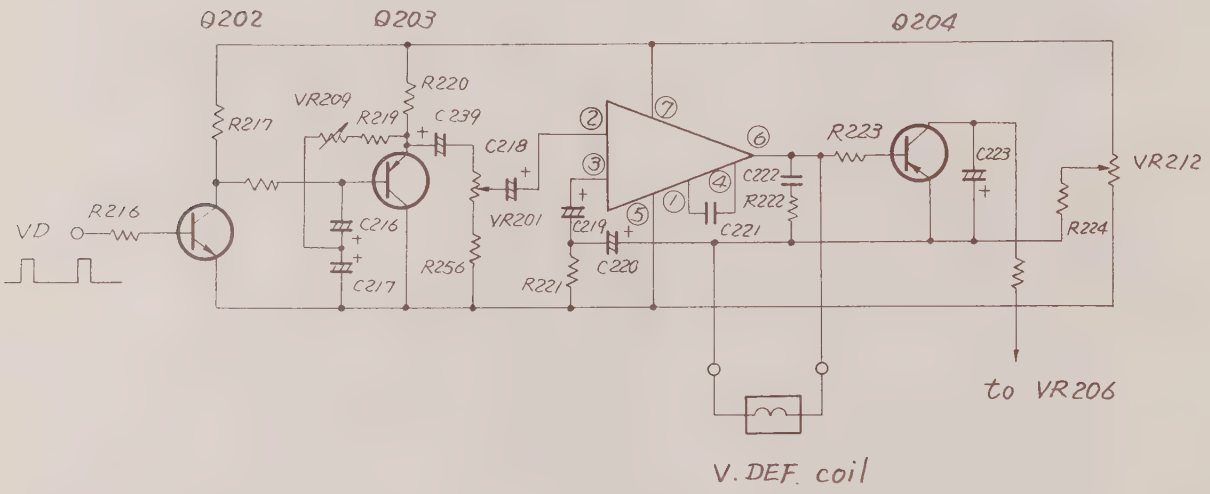


Fig. 4-30 Vertical deflection circuit

4-2-5 Regulated power supply circuit

Q205 is a voltage comparison amplifier. It detects output voltage at the base and controls the emitter follower of Q206 by comparing the voltage with the reference voltage. Q206 is in Darlingtom connection with Q601.

D203 is the starter diode, and it becomes OFF when +50V is applied to the cathode side. +9V is adjusted by VR203.

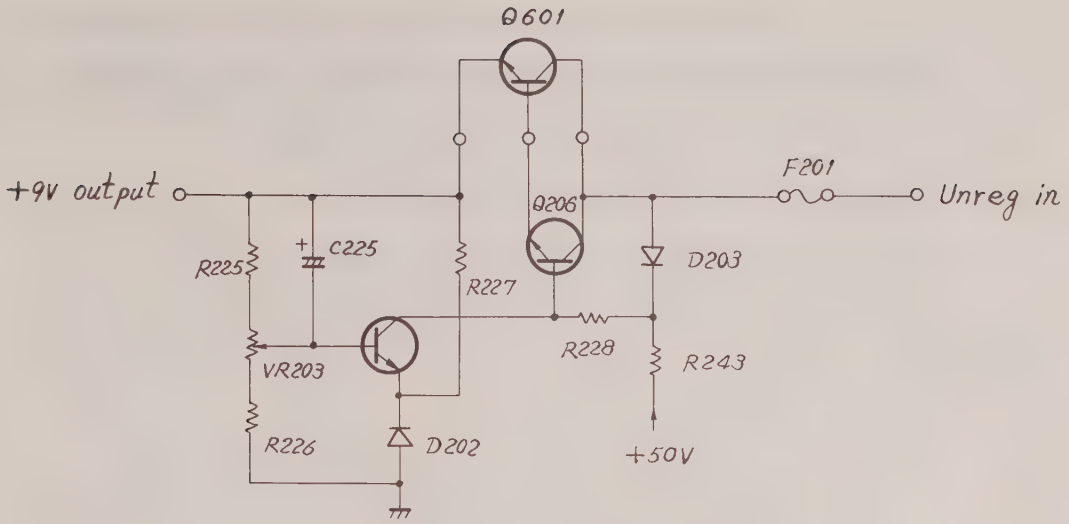


Fig. 4-31 Power supply circuit

4-2-6 Battery indicator circuit

This circuit indicates drop of the battery capacity by lighting the alarm lamp.

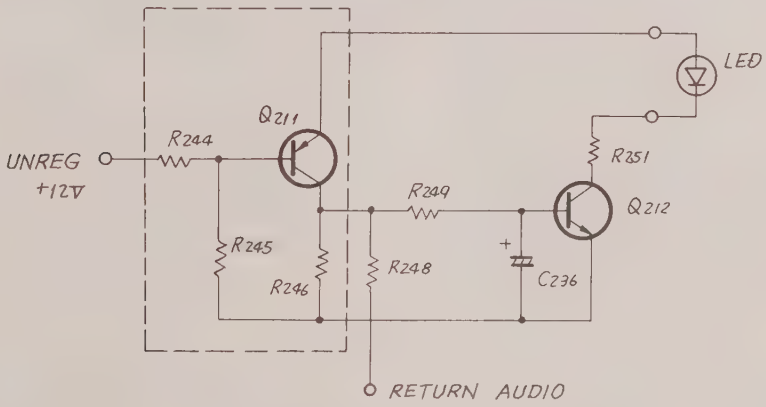


Fig. 4-32 Battery indicator circuit

When the battery on the VTR side becomes exhausted, the detection circuit on the VTR side operates and a DC component is superimposed onto the RETURN AUDIO signal. (In the normal case, the DC component is zero.)

This DC component passes R248 and switches Q212 to ON, so that the LED lights as the letter "B" in the finder. The circuit enclosed by the broken line switches Q211 to ON when the UNREG input of the camera becomes about 10.8 V and the LED lights.

However, the circuit enclosed by the broken line is not provided for cameras operating with a DC signal for RETURN AUDIO. For cameras provided with the circuit, R248 is not wired.

Accordingly, either the RETURN AUDIO DC signal or the UNREG voltage operates.

4-2-7 Return audio amplifier circuit

This circuit makes it possible to hear the audio signal with an earphone when the electronic viewfinder is used for monitoring of the VTR playback signal.

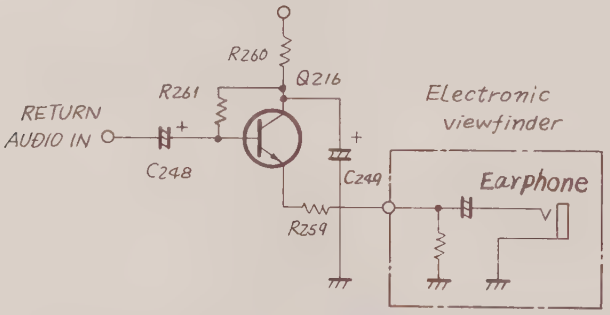


Fig. 4-33 Return audio amplifier circuit

4.3 Sub PCB

The SUB PC board is the circuit for driving the white balance meter.

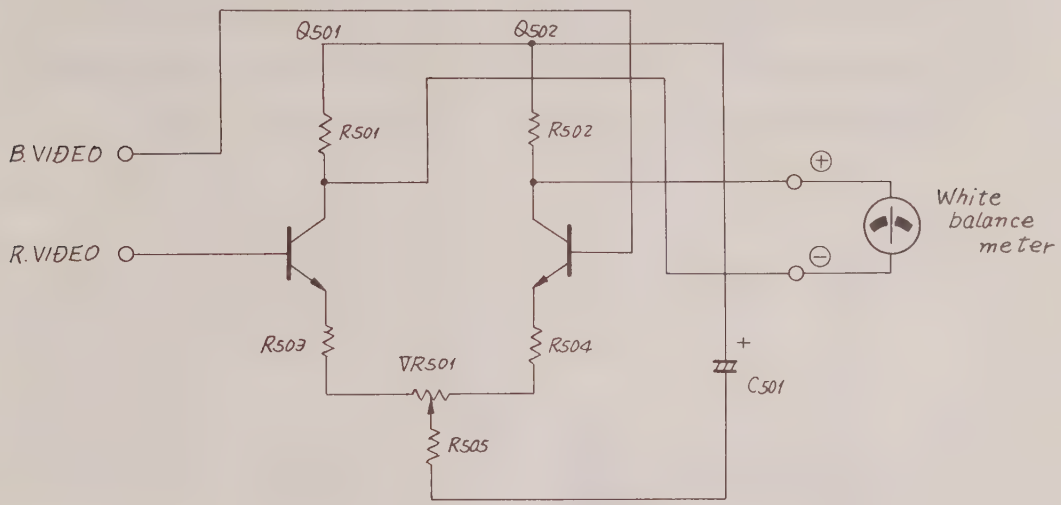


Fig. 4-34 Meter drive circuit

The meter is a center zero type. It receives the process output signals from R and B channels and indicates the difference between the levels of the two signals.

At the time of black level (with closed iris), the meter balance is set to the center with VR-501.

Prior to the actual use of the camera, televise a white object and set the needle of the balance meter to center by the color temperature adjustment control.

4.4 Sync/def PCB (PAL)

The SYNC circuit of GP-4 is composed of a CMOS IC (HD440071). This is a dual in line 28 pin plastic mould type IC operating with +7 V. Figs. 4-35 and Fig. 4-36 show the schematic diagram and the block diagram of HD440071.

Section A is a crystal oscillator using a CMOS inverter, and it oscillates at the frequency of 17.734475 MHz, four times the subcarrier fre-

quency. This oscillation frequency becomes the subcarrier after 1/4 frequency division. Further, the phases of the output signal obtained by dividing the output signal frequency by 162 and the output signal obtained by dividing the VCO output frequency by 161 are compared. The output of this comparator is rectified by the low-pass filter of section C and the resultant DC controls the VCO of section B. This

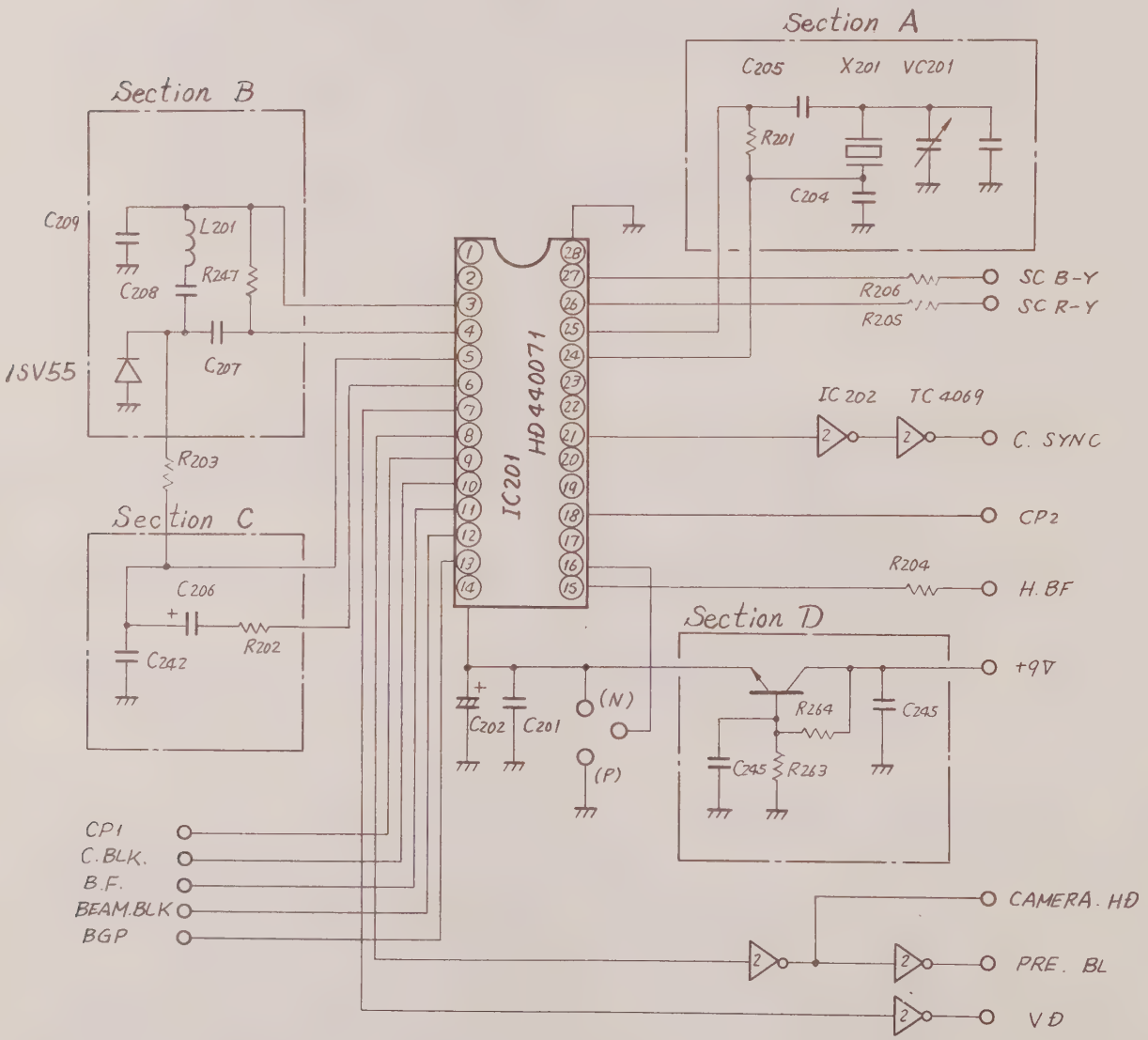


Fig. 4-35 Circuit diagram

is the socalled PLL circuit. By this PLL operation, the VCO oscillation frequency of part B becomes 282 times the horizontal frequency. This frequency is divided by 2 and is supplied to the PULSE FORMER as a clock pulse to obtain HD, VD, SYNC, etc. Section D is the power supply circuit for HD440071. Q215 composes a series regulator, and the +9 V input is converted to +7 V. IC202 is the pulse polarity inverter or the CMOS inverter operating as buffer.

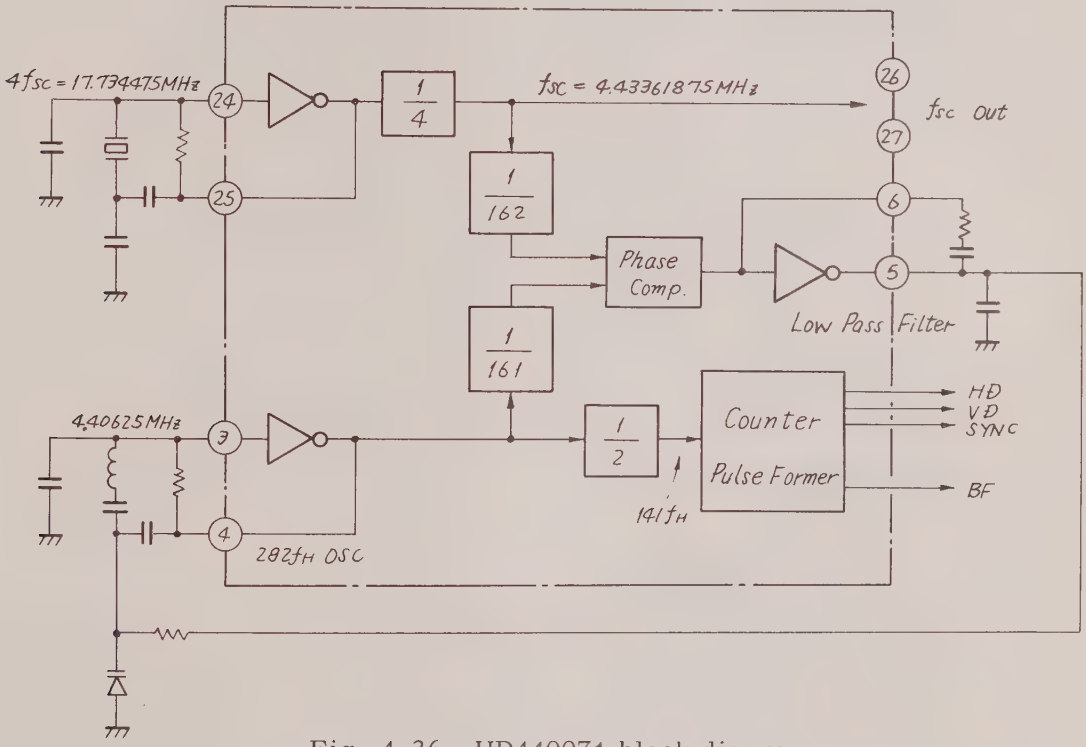


Fig. 4-36 HD440071 block diagram

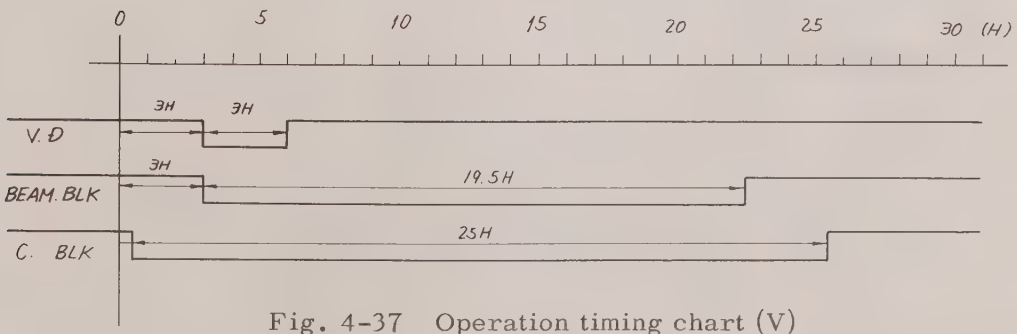


Fig. 4-37 Operation timing chart (V)

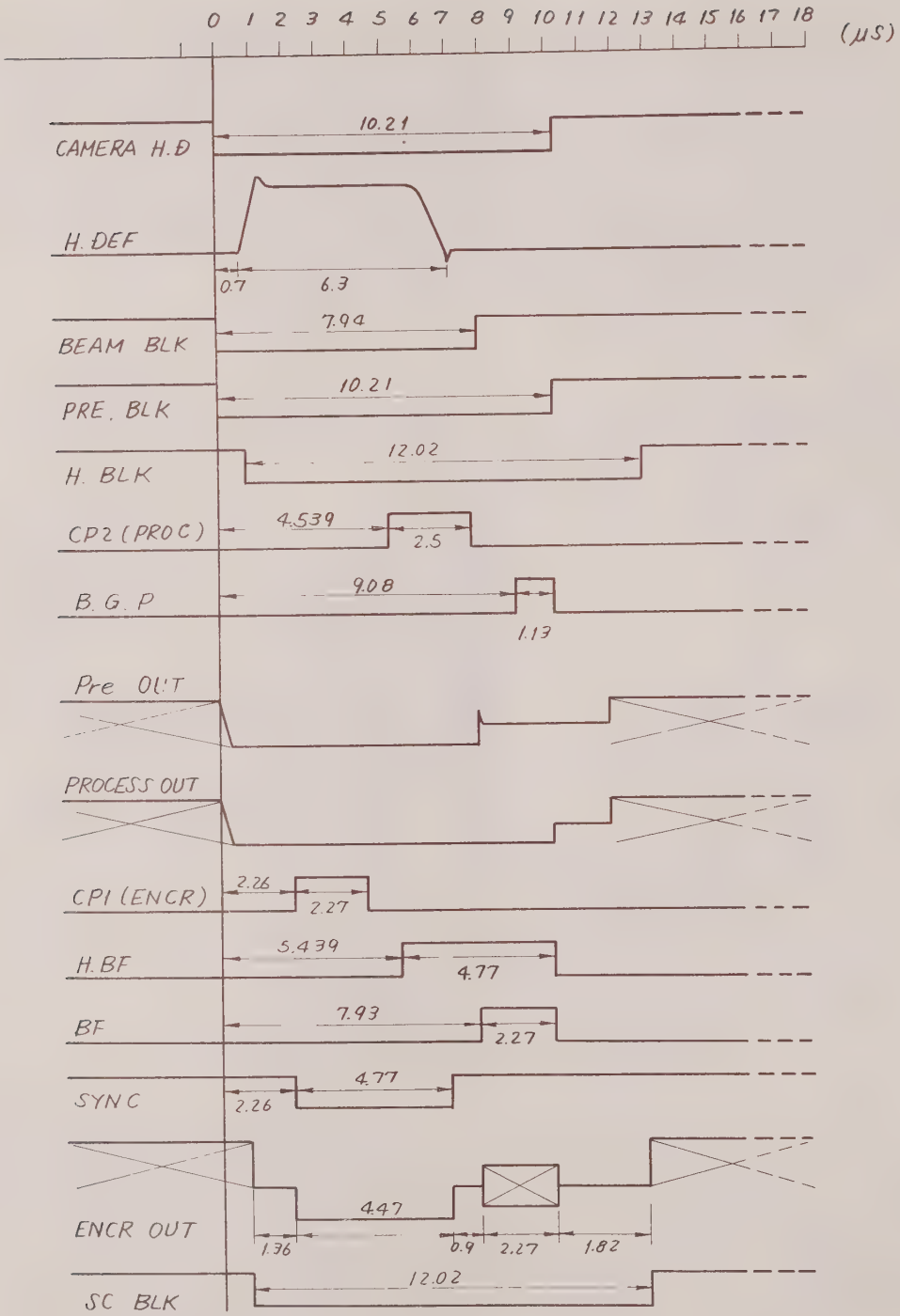


Fig. 4-38 Operation timing chart (H)

5. CIRCUIT ADJUSTMENT

5.1 Sync/def PCB

1) Adjustment of the supply voltage
   - o VR203 (+9 V)
   - o Adjust to +9 V at TP-4.

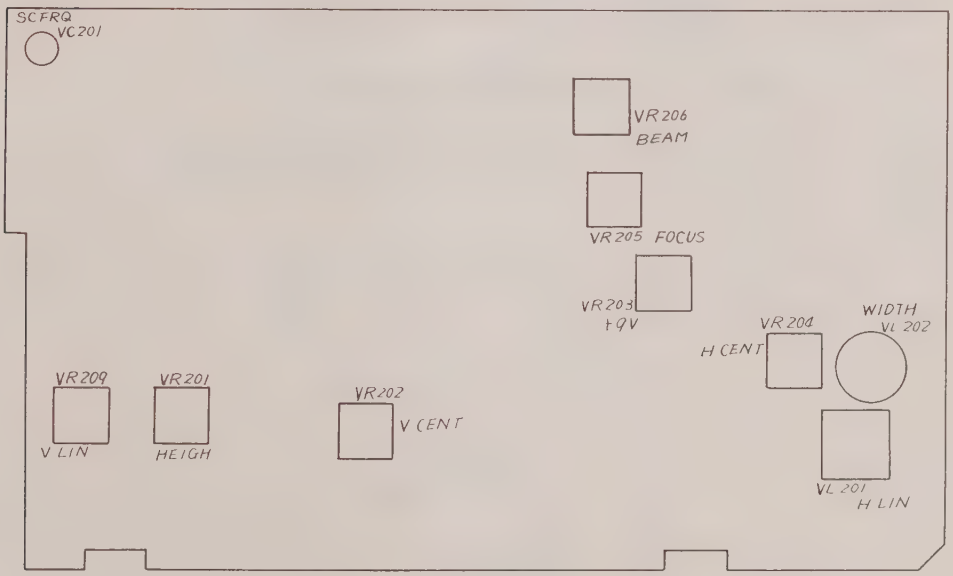
2) Adjustment of the SC (subcarrier) frequency
   - o VC201 (SC FRQ)

   Adjust the frequency to 3.579545 MHz (NTSC) (4.433619 MHz (PAL)) at TP-11.

For the following adjustments 3) to 6), refer to item 3/4. "Adjustment after vidicon exchange."

3) Adjustment of the vertical deflection
   - o VR201 (HEIGHT), VR202 (V.CENT), VR209 (V.LIN)

4) Adjustment of the horizontal deflection
   - o VL201 (H.LIN), VL202 (WIDTH), VR204 (H.CENT)
   - o Adjustment of VL201 (H.LIN) is not required at the time of vidicon exchange.



SYNC/DEF (PARTS SIDE)

Fig. 5-1

5) Electro static focus adjustment
   - o VR205 (FOCUS)

6) Beam voltage adjustment
   - o VR206 (BEAM)

5.2 Video PCB

For the following adjustments 1) to 6), refer to item 3.4. "Adjustment after vidicon exchange."

1) Black balance (set up) adjustment
   - o VR104 (G SET UP), VR106 (R SET UP), VR108 (B SET UP).

2) White balance adjustment
   - o VR102 (R.GAIN), VR104 (B.GAIN)

3) Crosstalk balance (color smear) adjustment
   - o VR105 (R.IMP), VR107 (B.IMP)

4) Dark current (ID) adjustment
   - o VR112 (ID)

5) Pulse canceller adjustment
   - o VR109 (GPC), VR110 (RPC), VR111 (BPC)

6) AGC video output level adjustment
   - o VR113 (AGC)

7) R-Y balance and B-Y balance adjustment
   - o VR114 (RYB), VR115 (BYB)
   - o Televise a fluorescent lamp or an incandescent lamp at a

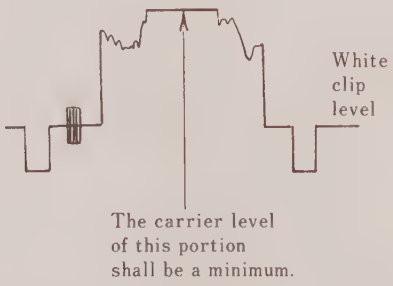


Fig. 5-2

distance of 4 to 5 m. (Televise a bright object and adjust so that white clip is applied to the video level.)

- o Turn VR114 and VR115 alternately so that the carrier of the white clip level portion becomes a minimum.

5.3 Sub PCB

1) Meter balance adjustment

- o VR501 (M.B)
- o Close the lens iris and adjust VR501 so that the white balance meter indicate the center. (at this time, black balance adjustment has been completed.).

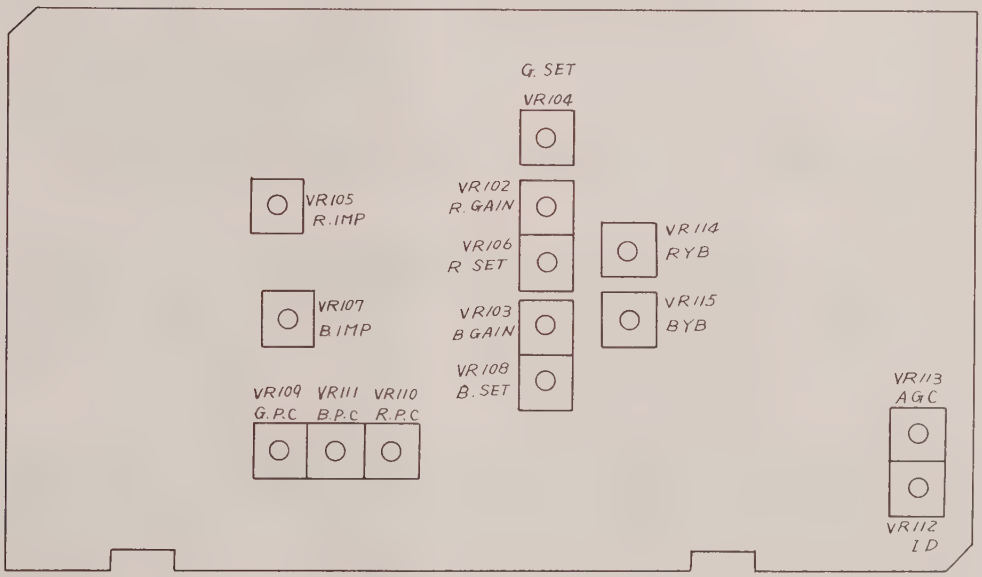


Fig. 5-3

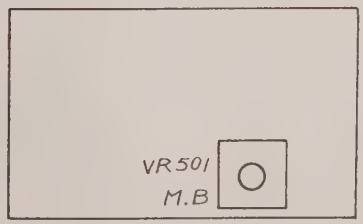


Fig. 5-4

5.4 Electronic viewfinder

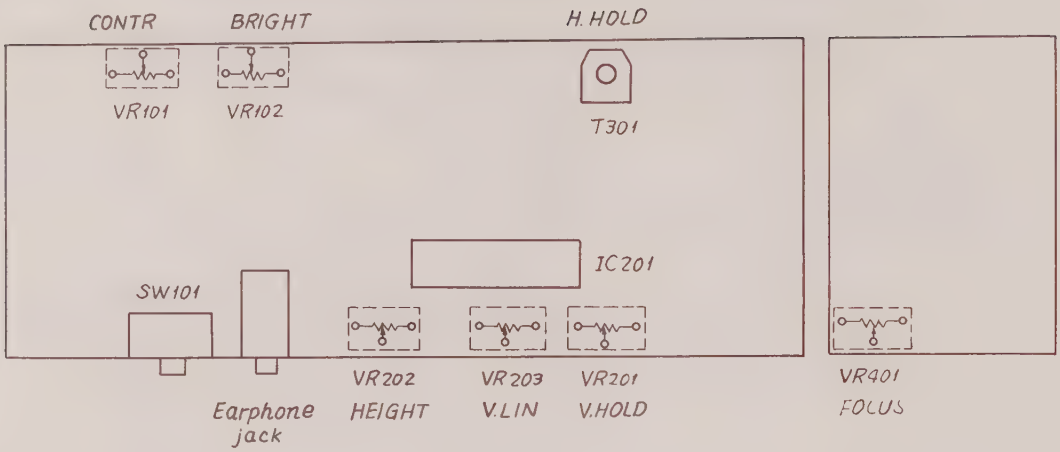


Fig. 5-5

The adjustment of each control is same as that of conventional TV receivers.

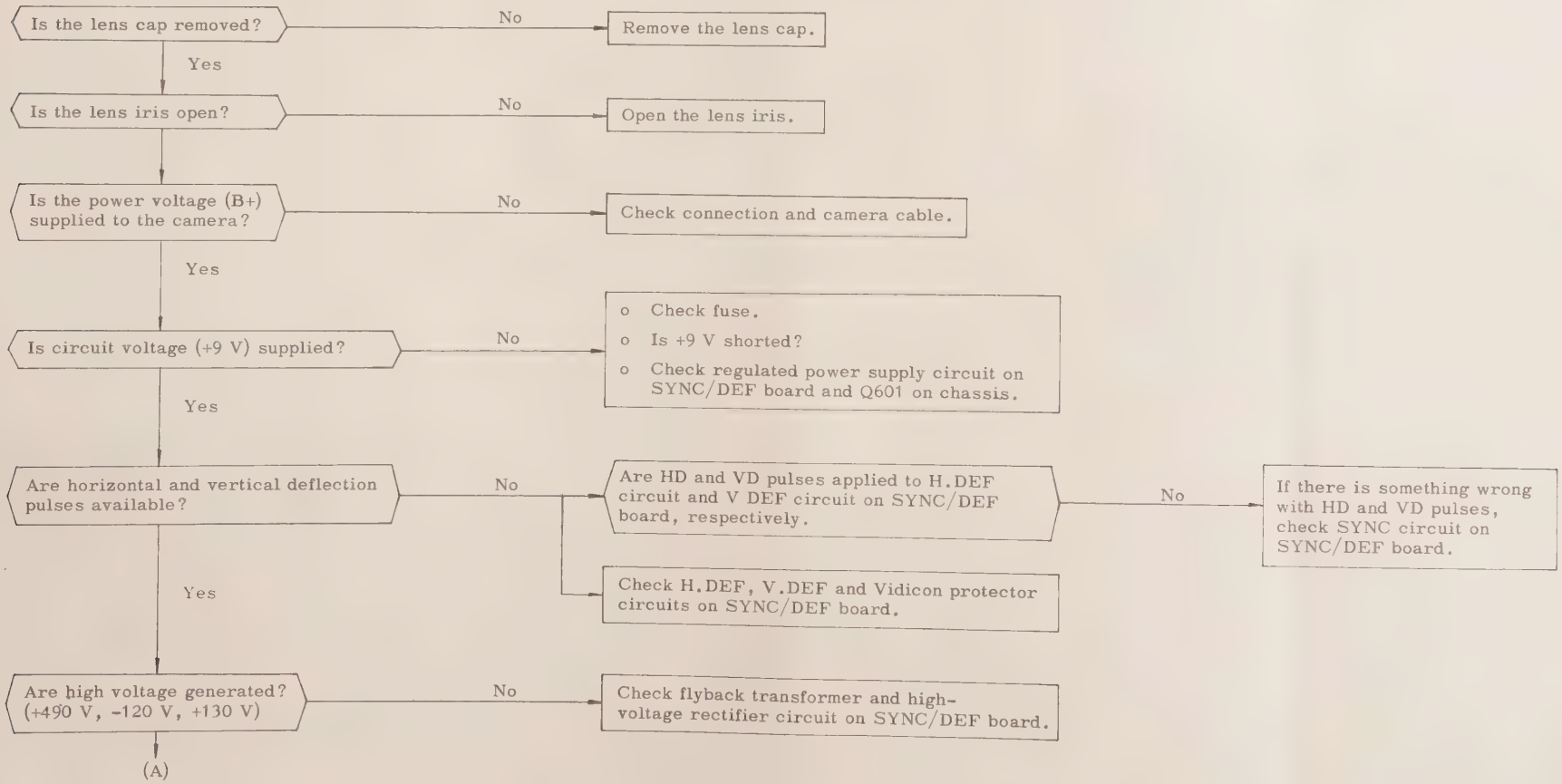
1. Vertical amplitude adjustment (VR202 HEIGHT)
   Vertical linearity adjustment (VR203 V.LIN)
   Adjust the vertical size and linearity. This adjustment is facilitated if the circle picture is observed.
2. Picture position adjustment (L303 centering magnet)
   Use the centering magnet attached to the deflection yoke to align the raster position.

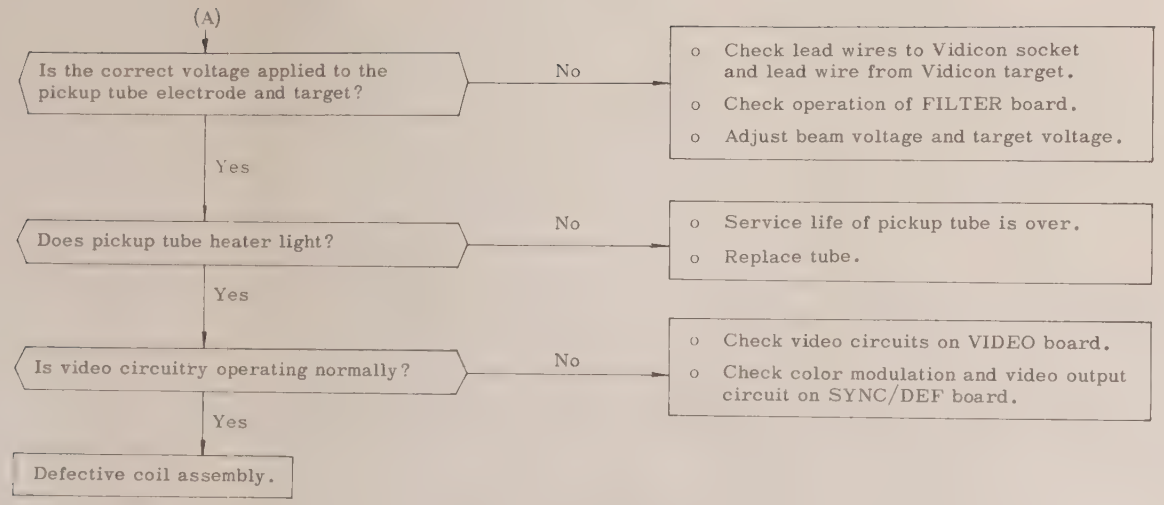
6. TROUBLESHOOTING

Before proceeding with the checks of the camera, confirm that the units are properly connected and that the supplied voltage are correct.

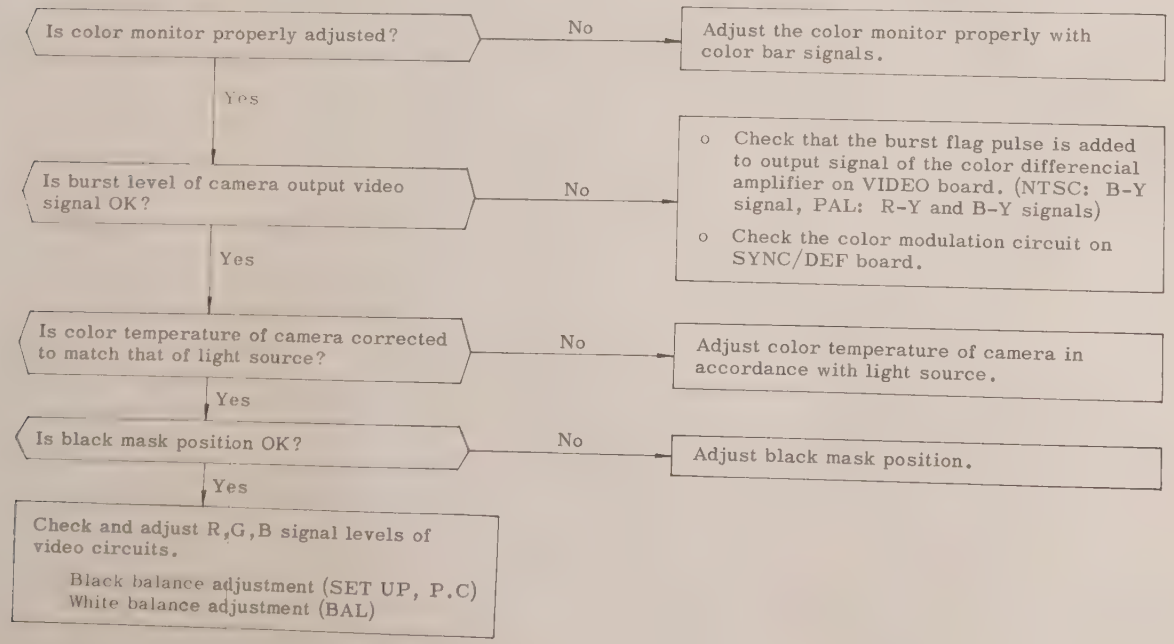
6.1 Camera section

1) No. picture


Is the lens cap removed?
No
Remove the lens cap.
Yes
Is the lens iris open?
No
Open the lens iris.
Is the power voltage (B+) supplied to the camera?
No
Check connection and camera cable.
Yes
Is circuit voltage (+9 V) supplied?
No
o Check fuse.
o Is +9 V shorted?
o Check regulated power supply circuit on SYNC/DEF board and Q601 on chassis.
Yes
Are horizontal and vertical deflection pulses available?
No
Are HD and VD pulses applied to H.DEF circuit and V DEF circuit on SYNC/DEF board, respectively.
No
If there is something wrong with HD and VD pulses, check SYNC circuit on SYNC/DEF board.
Check H.DEF, V.DEF and Vidicon protector circuits on SYNC/DEF board.
Yes
Are high voltage generated? (+490 V, -120 V, +130 V)
No
Check flyback transformer and high-voltage rectifier circuit on SYNC/DEF board.
(A)

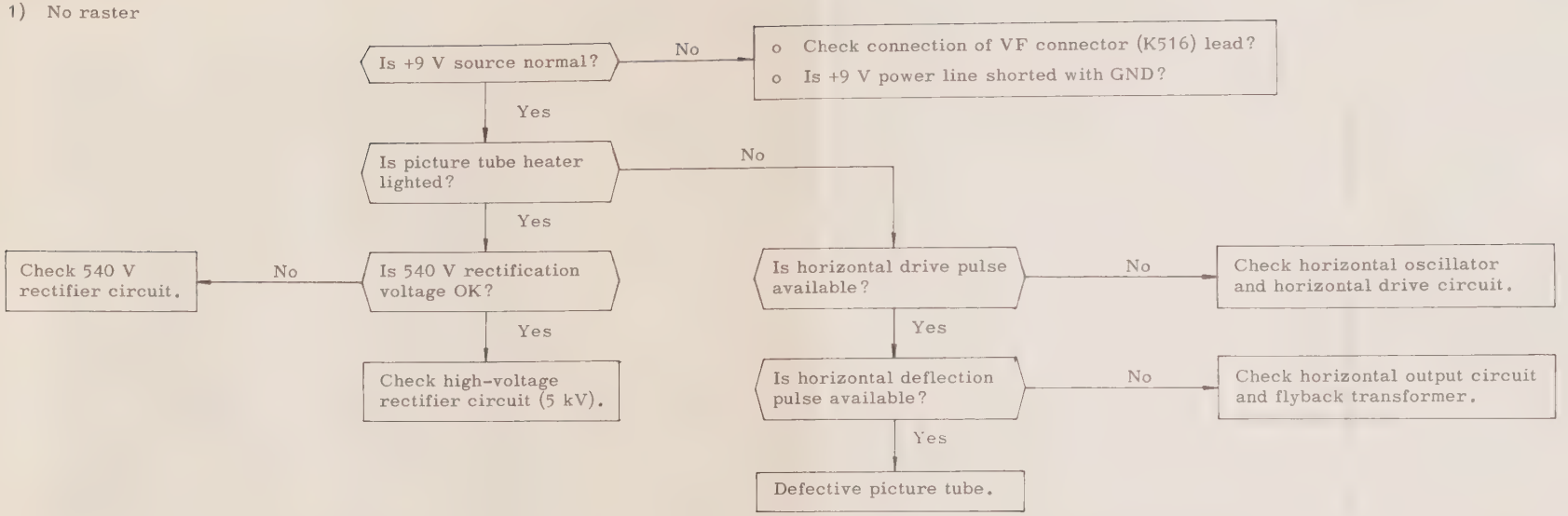

(A)
Is the correct voltage applied to the pickup tube electrode and target?
No
o Check lead wires to Vidicon socket and lead wire from Vidicon target.
o Check operation of FILTER board.
o Adjust beam voltage and target voltage.
Yes
Does pickup tube heater light?
No
o Service life of pickup tube is over.
o Replace tube.
Yes
Is video circuitry operating normally?
No
o Check video circuits on VIDEO board.
o Check color modulation and video output circuit on SYNC/DEF board.
Yes
Defective coil assembly.

2) Picture color is not normal.

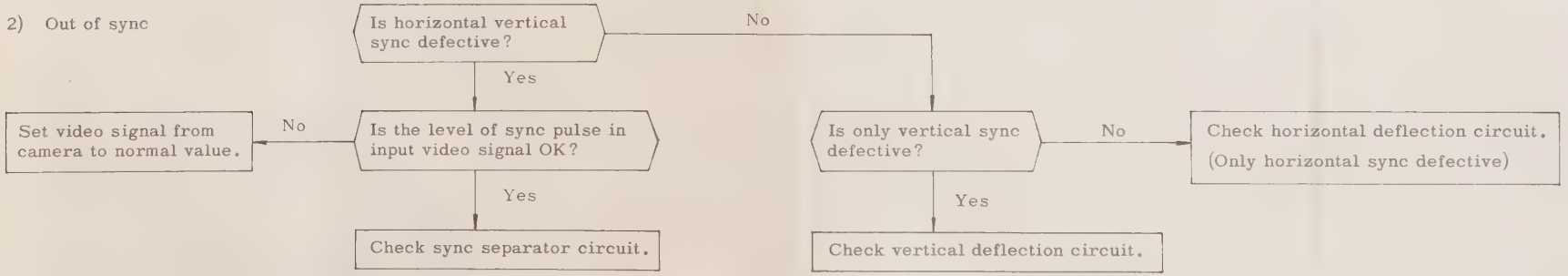

Is color monitor properly adjusted?
No
Adjust the color monitor properly with color bar signals.
Yes
Is burst level of camera output video signal OK?
No
o Check that the burst flag pulse is added to output signal of the color differencial amplifier on VIDEO board. (NTSC: B-Y signal, PAL: R-Y and B-Y signals)
o Check the color modulation circuit on SYNC/DEF board.
Yes
Is color temperature of camera corrected to match that of light source?
No
Adjust color temperature of camera in accordance with light source.
Yes
Is black mask position OK?
No
Adjust black mask position.
Yes
Check and adjust R,G,B signal levels of video circuits.
Black balance adjustment (SET UP, P.C)
White balance adjustment (BAL)

6.2 Viewfinder section

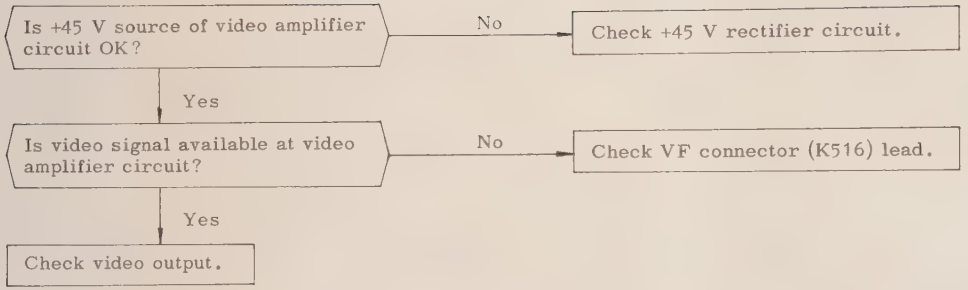
1) No raster



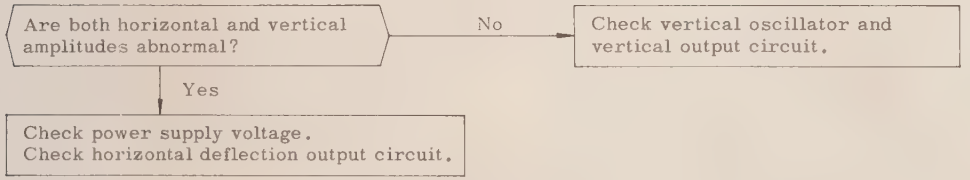
2) Out of sync



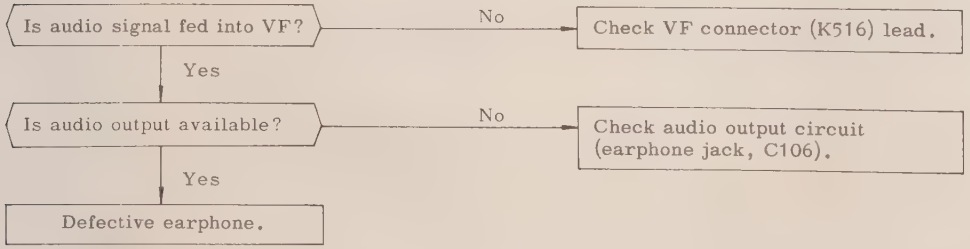
3) No picture



4) Amplitude is not normal.

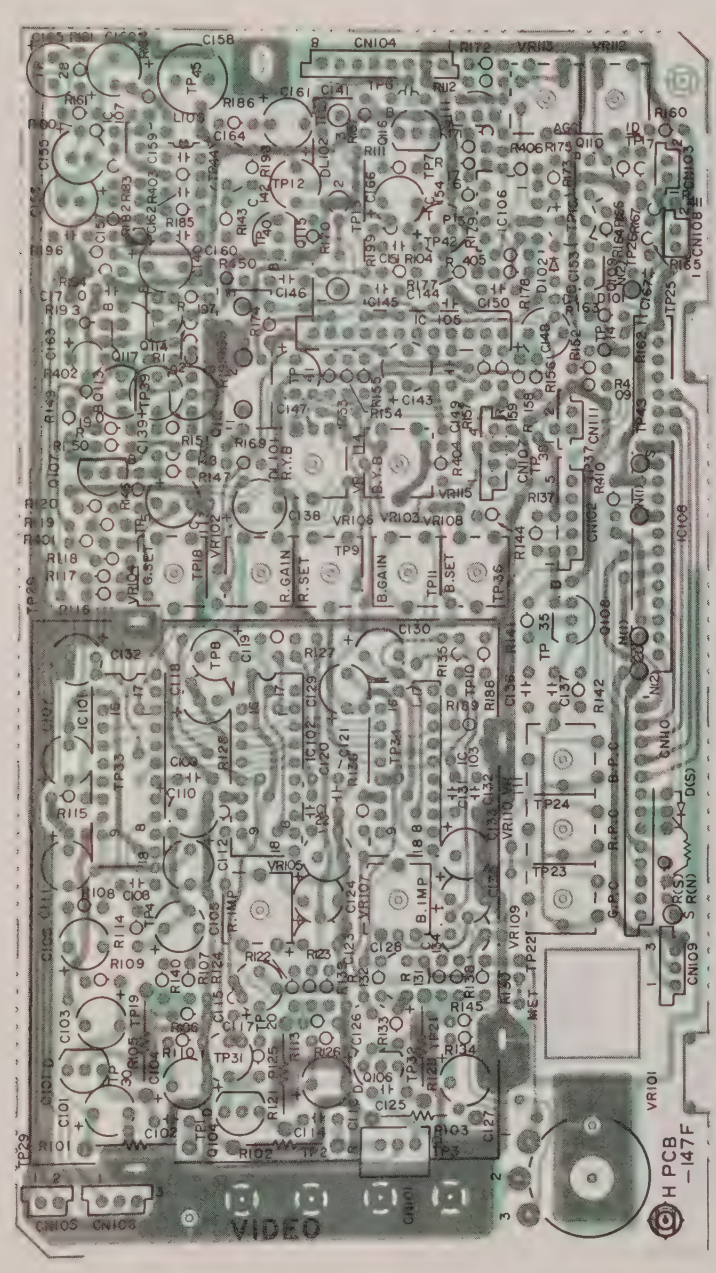

Are both horizontal and vertical amplitudes abnormal?
No
Check vertical oscillator and vertical output circuit.
Yes
Check power supply voltage.
Check horizontal deflection output circuit.

5) No sound from earphone

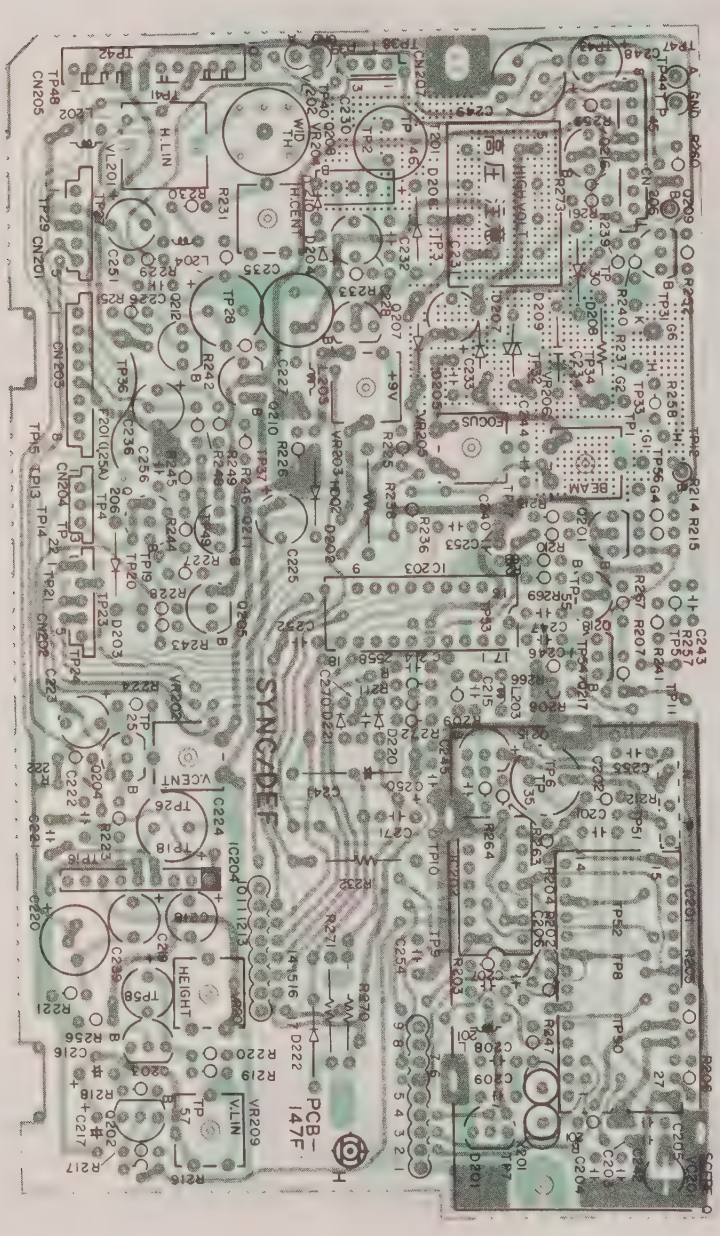


7. ELECTRICAL PARTS ARRANGEMENT

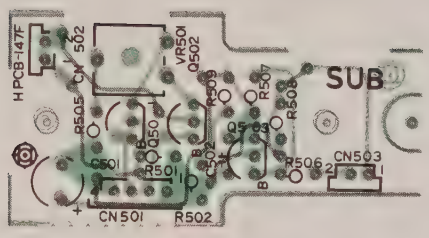
VIDEO PCB



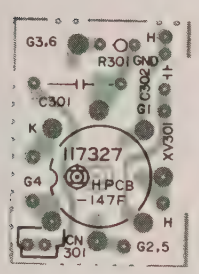
SYNC/DEF PCB


SYNC/DEF
PCB-147F
HIGH VOLT
FOCUS
HEIGHT
V.CENT
V.LIN
H LIN
WIDTH

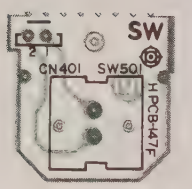
SUB PCB



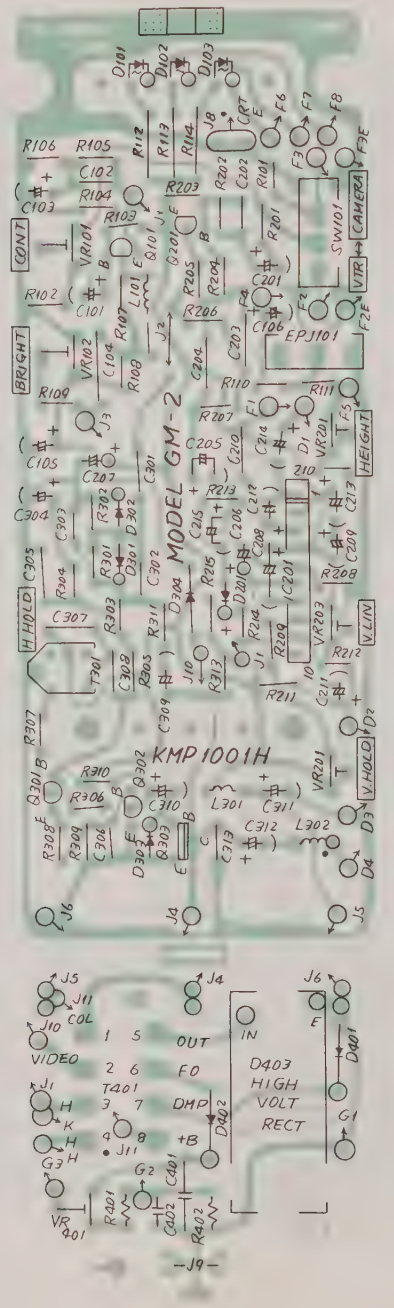
FILTER PCB



SWITCH PCB



ELECTRONIC VIEWFINDER, GM-2B



8. ELECTRICAL PARTS LIST

VIDEO PCB

Part Code	Symnol		Description				Remarks
			Transistors				
HTK0072	Q	101	FET, 2SK218Q				
		102	Not Used				
		103	"				
HTK0072		104	FET, 2SK218Q				
		105	Not Used				
HTK0072		106	FET, 2SK218Q				
HTA0192		107	2SA1015 (Y)				
HTC0148		108	2SC458 (C)				
HTC0470		109	2SC1890A (F)				
HTC0148		110	2SC458 (C)				
"		111	"				
HTA0192		112	2SA1015 (Y)				
HTC0148		113	2SC458 (C)				
"		114	"				
HTA0192		115	2SA1015 (Y)				
HTC0148		116	2SC458 (C)				
"		117	"				
			IC's				
ILH0092	IC	101	HA11719				
"		102	"				
"		103	"				
		104	Not Used				
IZZ0002		105	ZC0226				
ILH0091		106	HA17458PS				
ILT0014		107	TA7120P				
IZZ0020		108	ZC0227A				
			Diodes				
HDS0290	D	101	1S2473VH				
"		102	"				
			Resistors				
RCR3898	R	101	Carbon	1/2W	10MΩ	±5%	
"		102	"	"	"	"	
"		103	"	"	"	"	
RCE0179		104	"	1/4W	2.2MΩ	"	
RCR4051		105	"	"	1MΩ	"	
RCE0167		106	"	"	1800Ω	"	
RCE0139		107	"	"	10kΩ	"	
RCE0245		108	"	"	82Ω	"	
RCE0138		109	"	"	1kΩ	"	
RCE0146		110	"	"	120Ω	"	
RCE0138		111	"	"	1000Ω	"	
RCE0156		112	"	"	1500Ω	"	
RCE0157		113	"	"	15kΩ	"	
RCE0155		114	"	"	150Ω	"	
RCE0138		115	"	"	1000Ω	"	
RCE0167		116	"	"	1800Ω	"	
RCE0186		117	"	"	2700Ω	"	
RCE0206		118	"	"	390Ω	"	
RCE0184		119	"	"	27Ω	"	
RCE0176		120	"	"	2200Ω	"	
RCR4051		121	"	"	1MΩ	"	
RCE0156		122	"	"	1500Ω	"	
RCE0227		123	"	"	5600Ω	"	
RCE0245		124	"	"	82Ω	"	
RCE0138		125	"	"	1000Ω	"	
RCE0146		126	"	"	120Ω	"	
RCE0155		127	"	"	150Ω	"	
RCE0226		128	"	"	560Ω	"	
RCR4051		129	"	"	1MΩ	"	
RCE0156		130	"	"	1500Ω	"	
RCE0227		131	"	"	5600Ω	"	
RCE0245		132	"	"	82Ω	"	
RCE0138		133	"	"	1000Ω	"	
RCE0146		134	"	"	120Ω	"	
RCE0155		135	"	"	150Ω	"	
RCE0226		136	"	"	560Ω	"	
RCE0138		137	"	"	1000Ω	"	
RCE0198		138	"	"	330kΩ	"	
"		139	"	"	"	"	
"		140	"	"	"	"	
RCE0138		141	"	"	1000Ω	"	
"		142	"	"	"	"	
RCE0166		143	"	"	180Ω	"	
RCE0177		144	"	"	22kΩ	"	
RCE0207		145	"	"	3900Ω	"	
RCE0216		146	"	"	4700Ω	"	
"		147	"	"	"	"	
RCE0247		148	"	"	8200Ω	"	
RCE0196		149	"	"	3300Ω	"	
RCE0167		150	"	"	1800Ω	"	
RCE0196		151	"	"	3300Ω	"	
RCE0141		152	"	"	1MΩ	"	
RCE0176		153	"	"	2200Ω	"	
"		154	"	"	"	"	
RCE0157		155	"	"	15kΩ	"	
RCE0239		156	"	"	68kΩ	"	NTSC

Part Code	Symbol		Description				Remarks
RCE0140	R	156	Carbon	1/4W	100kΩ	±5%	PAL
RCE0176		157	"	"	2200Ω	"	
RCE0207		158	"	"	3900Ω	"	
RCE0238		159	"	"	6800Ω	"	
RCE0216		160	"	"	4700Ω	"	
RCE0217		161	"	"	47kΩ	"	
RCE0157		162	"	"	15kΩ	"	
RCE0139		163	"	"	10kΩ	"	
"		164	"	"	"	"	
RCE0176		165	"	"	2200Ω	"	
RCE0156		166	"	"	1500Ω	"	
"		167	"	"	"	"	
		168	Not Used				
RCE0196		169	Carbon	1/4W	3300Ω	"	
RCE0138		170	"	"	1000Ω	"	
RCE0159		171	"	"	10kΩ	"	
RCE0139		172	"	"	"	"	
RCE0168		173	"	"	18kΩ	"	
RCE0139		174	"	"	10kΩ	"	
"		175	"	"	"	"	
RCE0177		176	"	"	22kΩ	"	
RCE0139		177	"	"	10kΩ	"	
"		178	"	"	"	"	
"		179	"	"	"	"	
RCE0168		180	"	"	18kΩ	"	
RCE0237		181	"	"	680Ω	"	
RCE0228		182	"	"	56kΩ	"	
RCE0216		183	"	"	4700Ω	"	
RCE0176		184	"	"	2200Ω	"	
RCE0177		185	"	"	22kΩ	"	
RCE0226		186	"	"	560Ω	"	
RCE0137		187	"	"	100Ω	"	
RCE0216		188	"	"	4700Ω	"	
RCE0148		189	"	"	12kΩ	"	
RCE0208		190	"	"	39kΩ	"	
RCE0157		191	"	"	15kΩ	"	
RCE0138		192	"	"	1000Ω	"	
RCE0156		193	"	"	1500Ω	"	
RCE0138		194	"	"	1000Ω	"	
RCE0176		195	"	"	2200Ω	"	
RCE0177		196	"	"	22kΩ	"	
RCE0139		197	"	"	10kΩ	"	
RCE0206		198	"	"	390Ω	"	
RCE0138		199	"	"	1000Ω	"	
RCE0185		401	"	"	270Ω	"	
RCE0139		402	"	"	10kΩ	"	
RCE0197		403	"	"	33kΩ	"	
RCE0140		404	"	"	100kΩ	"	PAL only
RCE0141		405	"	"	1MΩ	"	
RCE0196		406	"	"	3300Ω	"	
RCE0139		409	"	"	10kΩ	"	
RCE0137		410	"	"	100Ω	"	
RCE0215		411	"	"	470Ω	"	
RCE0227		450	"	"	5600Ω	"	
			Var. Resistors				
RDV0386	VR	101	Carbon		1000Ω		
RNT0167		102	Metal		10kΩ		
"		103	"		"		
RNT0164		104	"		1000Ω		
"		105	"		"		
"		106	"		"		
"		107	"		"		
"		108	"		"		
RNT0167		109	"		10kΩ		
"		110	"		"		
"		111	"		"		
RNT0165		112	"		2kΩ		
RNT0166		113	"		5kΩ		
RNT0164		114	"		1000Ω		
"		115	"		"		
			Capacitors				
CEX0237	C	101	Elyc	160V	1μF		
CQA0037		102	Plastic	250V	0.01μF	±10%	
CEX0218		103	Elyc	50V	1μF		
CEX0184		104	"	16V	33μF		
"		105	"	"	"		
CEX0179		106	"	"	10μF		
"		107	"	"	"		
CCS0017		108	Ceramic	50V	0.1μF		
CCC1036		109	"	"	0.022μF		
CEX0168		110	Elyc	10V	100μF		
CEX0179		111	"	16V	10μF		
"		112	"	"	"		
"		113	"	"	"		
CQA0037		114	Plastic	250V	0.01μF	±10%	
CEX0218		115	Elyc	50V	1μF		
CEX0184		116	"	16V	33μF		
CEX0179		117	"	"	10μF		
"		118	"	"	"		

SYNC/DEF PCB

Part Code	Symbol		Description			Remarks
CEX0184	C	119	Elyc	16V	33μF	
CCS0017		120	Ceramic	50V	0.1μF	
CCC1036		121	"	"	0.022μF	
CEX0168		122	Elyc	10V	100μF	
CEX0179		123	"	16V	10μF	
"		124	"	"	"	
CQA0037		125	Plastic	250V	0.01μF	±10%
CEX0218		126	Elyc	50V	1μF	
CEX0184		127	"	16V	33μF	
CEX0176		128	"	"	10μF	
"		129	"	"	"	
CEX0184		130	"	"	33μF	
CCS0017		131	Ceramic	50V	0.1μF	
CCC1036		132	"	"	0.022μF	
CEX0168		133	Elyc	10V	100μF	
CEX0176		134	"	16V	10μF	
CEX0179		135	"	"	"	
CCS0016		136	Ceramic	50V	0.047μF	
"		137	"	"	"	
CEX0176		138	Elyc	16V	10μF	
"		139	"	"	"	
CEX0179		140	"	"	"	
CCS0017		141	Ceramic	50V	0.1μF	
CEX0184		142	Elyc	16V	33μF	
"		143	"	"	"	
CCC1034		144	Ceramic	50V	68 pF	
CCC1359		145	"	"	150 pF	
CCS0017		146	"	"	0.1μF	
CEX0184		147	Elyc	16V	33μF	
"		148	"	"	"	
CCC1034		149	Ceramic	50V	68 pF	
CCC1359		150	"	"	150 pF	
CCS0017		151	"	"	0.1μF	
CEX0168		152	Elyc	10V	100μF	
CEX0218		153	"	50V	1μF	
CEX0230		154	" (Bipolar)	"	"	
CEX0184		155	"	16V	33μF	
"		156	"	"	"	
CQA0011		157	Plastic	50V	0.022μF	±10%
CEX0164		158	Elyc	6.3V	330μF	
CCC1356		159	Ceramic	50V	470 pF	
CCC1014		160	"	"	47 pF	
CEX0218		161	Elyc	"	1μF	
CCC1136		162	Ceramic	"	100 pF	
CEX0179		163	Elyc	16V	10μF	
CEX0184		164	"	"	33μF	
CEX0218		165	"	50V	1μF	
CEX0184		166	"	16V	33μF	
CCS0017		167	Ceramic	50V	0.1μF	
CEX0168		168	Elyc	10V	100μF	
		169	Not Used			
CCC1182		170	Ceramic	50V	0.001μF	
			Coils			
	L	101	Not Used			
		102	"			
		103	"			
		104	"			
		105	"			
TLF0067		106	100μH			
			Delay Line			
EDD0066	DL	101	DL102 201D-151			
EDD0067		102	DL102 801D			
			Connectors			
JBT0013	CN	101	TL-25P-3L			
JBT0004		102	TL-25P-5V			
JBT0001		103	TL-25P-2V			
JBT0007		104	TL-25P-8V			
JBT0001		105	TL-25P-2V			
JBT0002		106	TL-25P-3V			
JBT0003		107	TL-25P-4V			
JBT0001		108	TL-25P-2V			
JBT0002		109	TL-25P-3V			
JBT0012		110	TL-25P-13V			
JBT0001		111	TL-25P-2V			
8327846M	K	101	8327846M			

Part Code	Symbol		Description			Remarks
			Transistors			
HTC0057	Q	201	2SC1213 (C)			
HTC0148		202	2SC458 (C)			
HTA0192		203	2SA1015 (Y)			
HTA0104		204	2SA778A (K)			
HTC0148		205	2SC458 (C)			
HTC0467		206	2SC1335 (E)			
HTC0148		207	2SC458 (C)			
HTD0074		208	2SD781			
HTC0470		209	2SC1890A (F)			
HTC0057		210	2SC1213 (C)			
HTA0192		211	2SA1015 (Y)			
HTC0467		212	2SC1335 (E)			
		213	Not Used			
		214	"			
HTC0148		215	2SC458 (C)			
HTC0057		216	2SC1213 (C)			
HTC0148		217	2SC458 (C)			
"		218	"			
			IC's			
IDH0728	IC	201	HD440072			
IDT0017		202	TC4069UBP			
ILH0093		203	HA11720			
ILL0052		204	LA4140			
			Diodes			
HDS0353	D	201	Varicap diode, 1SV55			
HDH0033		202	Zener, HZ6B			
HDV0019		203	V06C			
HDS0290		204	1S2473VH			
HDV0043		205	V09C			
HDU0014		206	U06C			
HDV0043		207	V09C			
HDV0046		208	V11L			
HDE0016		209	ZNR, ERZ08D3J301			
HDS0290		220	1S2473VH			
"		221	"			
HDS0289		222	1S2473			
			Resistors			
RCE0141	R	201	Carbon	1/4W	1MΩ	±5%
RCE0168		202	"	"	18kΩ	"
RCE0140		203	"	"	100kΩ	"
RCE0138		204	"	"	1000Ω	"
RCE0238		205	"	"	6800Ω	"
"		206	"	"	"	"
RCE0207		207	"	"	3900Ω	"
"		208	"	"	"	"
RCE0215		209	"	"	470Ω	"
RCE0138		210	"	"	1000Ω	"
"		211	"	"	"	"
RCE0139		212	"	"	10kΩ	"
RCE0138		213	"	"	1000Ω	"
RCE0236		214	"	"	68Ω	"
RCE0138		215	"	"	1000Ω	"
RCE0216		216	"	"	4700Ω	"
RCE0228		217	"	"	56kΩ	"
RCE0226		218	"	"	560Ω	"
RCE0196		219	"	"	3300Ω	"
RCE0139		220	"	"	10kΩ	"
RCE0174		221	"	"	22Ω	"
RCE0138		222	"	"	1000Ω	"
RCE0139		223	"	"	10kΩ	"
RCE0138		224	"	"	1000Ω	"
RCE0215		225	"	"	470Ω	"
RCE0156		226	"	"	1500Ω	"
RCE0237		227	"	"	680Ω	"
RCE0228		228	"	"	56kΩ	"
RCE0176		229	"	"	2200Ω	"
RCE0155		230	"	"	150Ω	"
RCE0137		231	"	"	100Ω	"
RCR4099		232	"	"	4700Ω	"
RCE0237		233	"	"	680Ω	"
		234	Not Used			
		235	"			
RCE0140		236	Carbon	1/4W	100kΩ	±5%
RCR3926		237	"	1/2W	220kΩ	"
RCR3936		238	"	"	33Ω	"
RCE0228		239	"	1/4W	56kΩ	"
RCE0158		240	"	"	150kΩ	"
RCE0157		241	"	"	15kΩ	"
RCE0215		242	"	"	470Ω	"
RCE0248		243	"	"	82kΩ	"
RMR0436		244	Metal	"	10kΩ	±1%
RMR0750		245	"	"	35.7kΩ	"
RCE0176		246	Carbon	"	2200Ω	±5%
RCE0141		247	"	"	1MΩ	"

Part Code	Symbol		Description				Remarks
	R	248	Not Used				
RCE0139		249	Carbon	1/4W	10kΩ	±5%	
		250	Not Used				
RCE0156		251	Carbon	1/4W	1500Ω	±5%	
RCE0176		252	"	"	2200Ω	"	
		253	Not Used				
		254	"				
RCE0148		255	Carbon	1/4W	12kΩ	±5%	
RCE0216		256	"	"	4700Ω	"	
RCE0196		257	"	"	3300Ω	"	
RCE0166		258	"	"	180Ω	"	
RCE0194		259	"	"	33Ω	"	
RCE0245		260	"	"	82Ω	"	
RCE0217		261	"	"	47kΩ	"	
		262	Not Used				
RCE0139		263	Carbon	1/4W	10kΩ	±5%	
RCE0167		264	"	"	1800Ω	"	
		265	Not Used				
RCE0176		266	Carbon	1/4W	2200Ω	±5%	
RCE0207		267	"	"	3900Ω	"	
"		268	"	"	"	"	
RCE0176		269	"	"	2200Ω	"	
RCR4062		270	"	"	15kΩ	"	
RCR4107		271	"	"	560Ω	"	
RCE0207		272	"	"	3900Ω	"	
			Var. Resistors				
RNT0166	VR	201	Metal		5kΩ		
"		202	"		"		
RNT0163		203	"		500Ω		
RNT0164		204	"		1000Ω		
RNT0171		205	"		1MΩ		
"		206	"		"		
		207	Not Used				
		208	"				
RNT0166		209	Metal		5kΩ		
83210985	VC	201	Var. Capacitor	50V	20 pF		
			Capacitors				
CCS0017	C	201	Ceramic	50V	0.1μF		
CEX0180		202	Elyc	16V	100μF		
CCC1002		203	Ceramic	50V	10 pF		
CCC1014		204	"	"	47 pF		
CCC1030		205	"	"	0.01μF		
CEX0231		206	Elyc (Bipolar)	"	0.47μF		
CQA0009		207	Plastic	"	0.01μF	±10%	
CQA0013		208	"	"	0.047μF	"	
CCC1363		209	Ceramic	"	180 pF		NTSC
CCC1358		209	"	"	220 pF		PAL
		210-213					
CCC1030		214	Ceramic	50V	0.01μF		
CCC1007		215	"	"	22 pF		NTSC
CCC1004		215	"	"	15 pF		PAL
CSC0277		216	Tantal	16V	4.7μF		
"		217	"	"	"		
CEX0184		218	Elyc	"	33μF		
"		219	"	"	"		
CEX0166		220	"	6.3V	470μF		
CCC1182		221	Ceramic	50V	0.001μF		
CCS0016		222	"	"	0.047μF		
CEX0237		223	Elyc	16V	1μF		
CEX0180		224	"	"	100μF		
CEX0179		225	"	"	10μF		
CCC1182		226	Ceramic	50V	0.001μF		
CEX0180		227	Elyc	16V	100μF		
CEX0179		228	"	"	10μF		
		229	Not Used				
CEX0168		230	Elyc	10V	100μF		
CEX0237		231	"	160V	1μF		
CQA0045		232	Plastic	250V	0.0033μF	±10%	
CQA0037		233	"	"	0.01μF	"	
CQT0020		234	"	630V	0.022μF		
CEX0168		235	Elyc	10V	100μF		
CEX0179		236	"	16V	10μF		
		237	Not Used				
		238	"				
CEX0184		239	Elyc	16V	33μF		
CCS0017		240	Ceramic	50V	0.1μF		
CEX0268		241	Elyc	16V	100μF		
CQA0003		242	Plastic	50V	0.001μF	±10%	
CCC1025		243	Ceramic	"	100 pF		
CQA0037		244	Plastic	250V	0.01μF	±10%	
CCC1030		245	Ceramic	50V	"		
"		246	"	"	"		
"		247	"	"	"		
CEX0179		248	Elyc	16V	10μF		
CEX0180		249	"	"	100μF		
CCC1030		250	Ceramic	50V	0.01μF		

Part Code	Symbol		Description				Remarks
CEX0184	C	251	Elyc	16V	33μF		
CCC1014		252	Ceramic	50V	47 pF		
"		253	"	"	"		
"		254	"	"	"		
"		255	"	"	"		
CCC1030		256	"	"	0.01μF		
CCC1002		260	"	"	10 pF		U only
"		261	"	"	"		"
CCS0017		262	"	"	0.1μF		"
CCC1030		270	"	"	0.01μF		
"		271	"	"	"		
			Coils				
TLS0036	L	201	22μH				NTSC
TLS0035		201	18μH				PAL
TLF0021		202	2.2mH				NTSC
TLF0136		202	3.3mH				PAL
TLF0067		203	100μH				NTSC
TLF0066		203	82μH				PAL
TLF0109		204	22mH				
TLF0004		205	100μH				
TLL0117	VL	201	H.LIN	LC0177			
TLL0051		202	H.WIDTH	LC0170			
TTT0251	T	201	Transformer	TC-0461			
			Crystals				
AAN0001	X	201	NC-18C	14.31818 MHz			NTSC
AAN0002		201	"	17.73447 MHz			PAL
			Connectors				
JBT0004	CN	201	TL25P-5V				
"		202	"				
JBT0007		203	TL25P-8V				
JBT0002		204	TL25P-3V				
JBX0429		205	B10P-SHF-1AA				
JBT0007		206	TL25P-8V				
JBT0002		207	TL25P-3V				
			Fuse				
EFL0131	F	201	TSCR	1.25A	125V UL		

SUB PCB

Part Code	Symbol		Description				Remarks
			Transistors				
HTC0148	Q	501	2SC458 C				
"		502	"				
			Resistors				
RCE0196	R	501	Carbon	1/4W	3300Ω	±5%	
"		502	"	"	"	"	
		503	Not Used				
		504	"				
RCE0176		505	Carbon	1/4W	2200Ω	±5%	
			Capacitor				
CEX0179	C	501	Elyc	16V	10μF		
			Var. Resistor				
RNT0163	VR	501	Metal		500Ω		
			Connectors				
JBT0003	CN	501	TL-25P-4V				
JBT0001		502	TL-25P-2V				

FILTER PCB

Part Code	Symbol	Description	Remarks
		Resistor	
RCE0141	R 301	Carbon 1/4W 1MΩ ±5%	
		Capacitors	
CQT0020	C 301	Plastic 630V 0.022μF	
CQA0037	302	" 250V 0.01μF	
8332972	XV 301	Socket S7-504B-05	
JBT0001	CN 301	Connector TL-25P-2V	

SWITCH PCB

Part Code	Symbol	Description	Remarks
		Switch	
SSP0361	SW 501	Key J-P 5029 #01	
		Connector	
JBT0001	CN 401	TL-25P-2V	

CHASSIS

Part Code	Symbol	Description	Remarks
HTD0101	Q 601	Transistor 2SD880 Y	
HYX0010		Spacer 30E-T0-220	
8332971	Mic 501	Mic ESM-10	
EML0002	M 501	Meter D12A65B	
		Switch	
8332909	502	Slide 562320-C	
JJX0036	J 501	Mic Jack 4118-2	
8332899	L 501	Coil Assembly LC-0176	
DCH0035	V 501	Vidicon HS-253	
BCB0067	K 515	Camera Cable WC-0038	
		Connectors	
8327846A	K 501	8327846A, With Lead Wire	
8327846B	502	8327846B, "	
8327846C	503	8327846C, "	
8327846D	504	8327846D, "	
8327846E	505	8327846E, "	
8327846F	506	8327846F, "	
8327846G	507	8327846G, "	
8327846H	508	8327846H, "	
8327846I	509	8327846I, "	
8327846J	510	8327846J, "	
8327846L	517	8327846L, "	
8327846K	511	8327846K, (BLK,YEL,BLU,WHT,GRN, ORG,RED)	
JBT0016	512	TL-25H-5	
JBT0014	513	TL-25H-2	

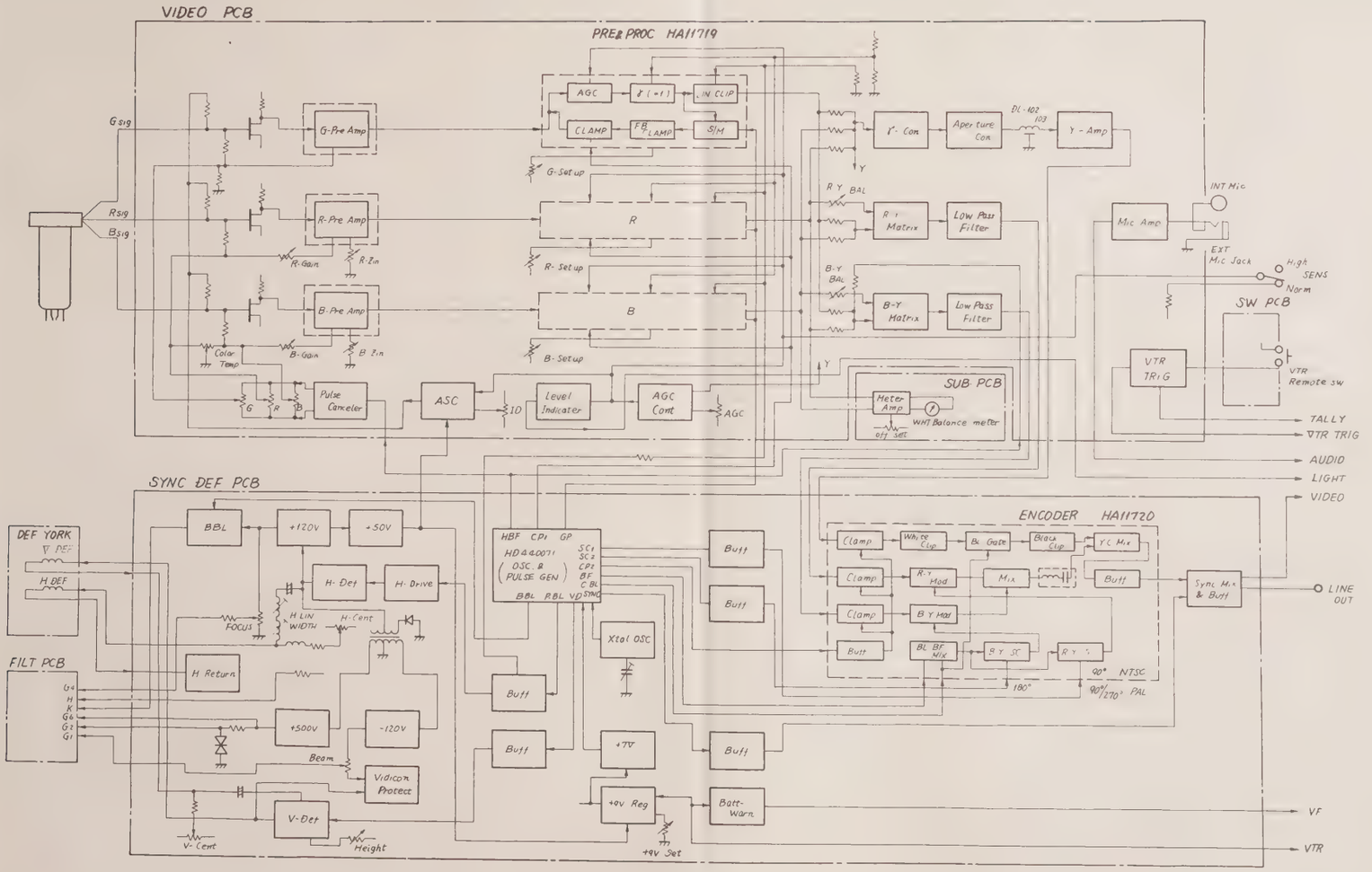
Part Code	Symbol	Description	Remarks
JBT0022	K 514	TL-25H-3	
BBZ0216	516	TL-25H-8 With Lead Wire	
8334613		Pin Receptacle TL-0144, For TL-25H type	

ELECTRONIC VIEWFINDER, GM-2B

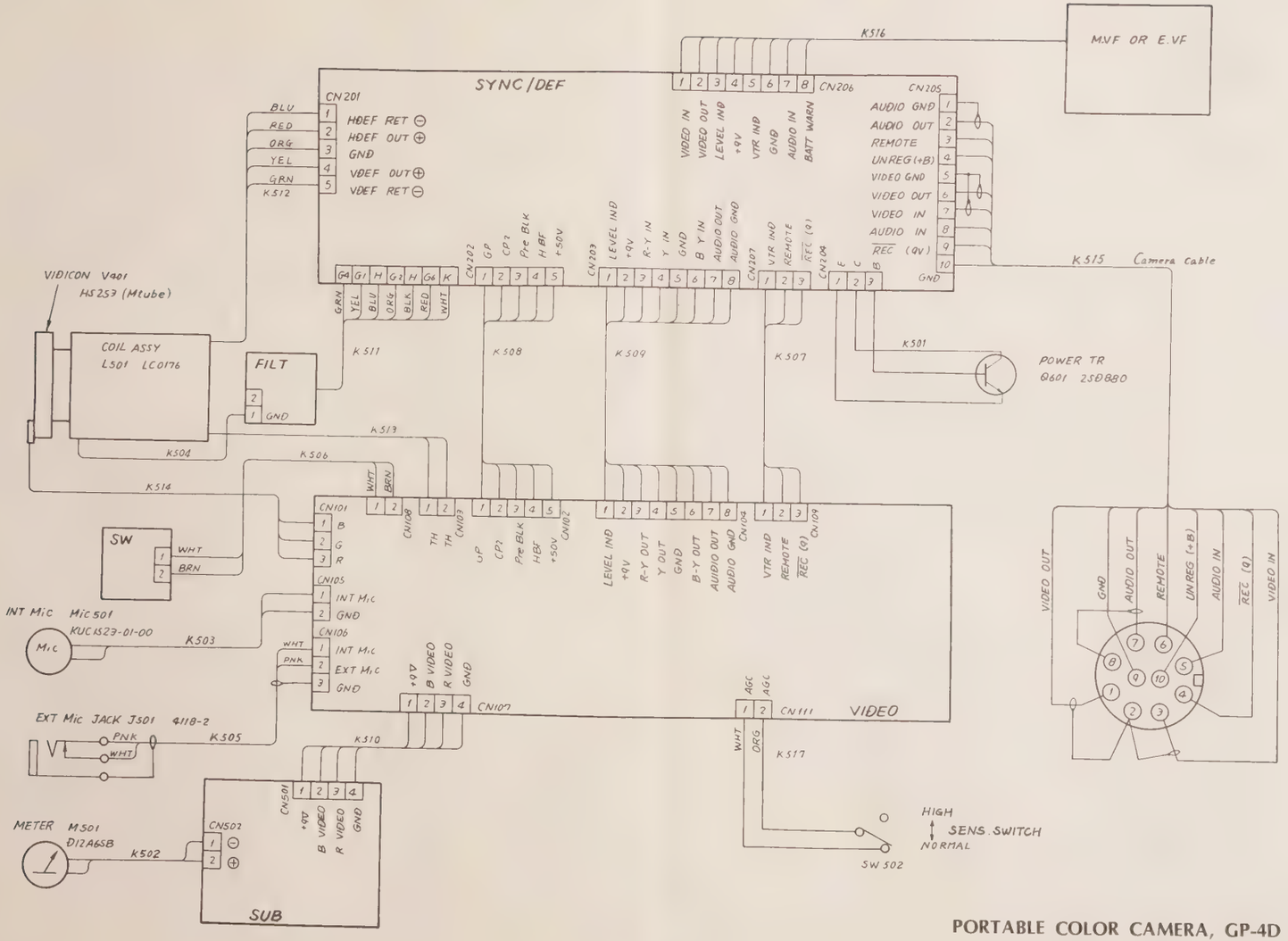
PRODUCT SAFETY NOTICE --- Components marked with a ⚠ have special characteristics important to safety. Before replacing any of these components, read carefully the PRODUCT SAFETY NOTICE of this manual. Do not degrade the safety of this viewfinder through improper servicing.

Part Code	Symbol		Description				Remarks
DPX0025	V	101⚠	CRT	40CB4			
			Transistors				
HTC0546	Q	101	2SC1980				or 2SC1933
HTA0198		201	2SA564				or 2SA733
HTC0547		301	2SC828 or 2SC1684				or 2SC945
"		302	"				"
8346787		303⚠	2SC1567A Assy (with temp. Fuse 103°C)				
ILM0244	IC	201	IC	μPC 1031H2			
			Diodes				
HDL0021	D	101	LED, LN25RP				
"		102	"				
"		103	"				
HDM0092		201	MA150				or 1SS53
HDO0010		301	OA91				
"		302	"				
HDM0092		303	MA150				or 1SS53
HDW0024		304⚠	WO6C				or ERB2902
HDV0043		401	V09C				or ERB24-04D
HDV0026		402⚠	V11J				or ERB26-20
HZT0008		403⚠	HV-Rectifier	TCXB002H			
TLE0020	L	101	Coil	100μH			
"		301	"	"			
TLH0037		302	Coil H-Lin,	HL1218SH-01			
TLK0016		303⚠	DEF Yoke	KY1001H			
TTE0009	T	301	OSC. Transformer	ELM7Q716B			
TTK0001		401⚠	Flyback Transformer	KF7303H			
SSV0146	SW	101	Switch	HSW0525-01-010			
JJE0001	EJ	101	Jack Earphone	EJU3J			
ETS0132	J	4	Terminal	SJTK-4			3 pcs.
JST0002		7	Socket, CRT	TWHV300/002			
			Var, Resistors				
RDE0037	VR	101	Carbon		1kΩ B		
RDE0038		102	"		500kΩ B		or 470kΩ B
RDE0032		201	"		20kΩ B		
RDE0031		202	"		10kΩ B		
RDE0030		203	"		1kΩ B		
RNE0002		401⚠	Metal		1MΩ B		
			Resistors				
RCE0245	R	101	Carbon	1/4W	82Ω	±5%	
RCE0137		102	"	"	100Ω	"	
RCE0168		103	"	"	18kΩ	"	
RCE0247		104	"	"	8200Ω	"	
RCE0155		105	"	"	150Ω	"	
RCE0246		106	"	"	820Ω	"	
RCE0196		107	"	"	3300Ω	"	
RCE0221		108	"	"	5100Ω	"	
RCE0141		109	"	"	1MΩ	"	
RCE0137		110	"	"	100Ω	"	
		111	Not Used				
RCE0195		112	Carbon	1/4W	330Ω	±5%	
"		113	"	"	"	"	
"		114	"	"	"	"	

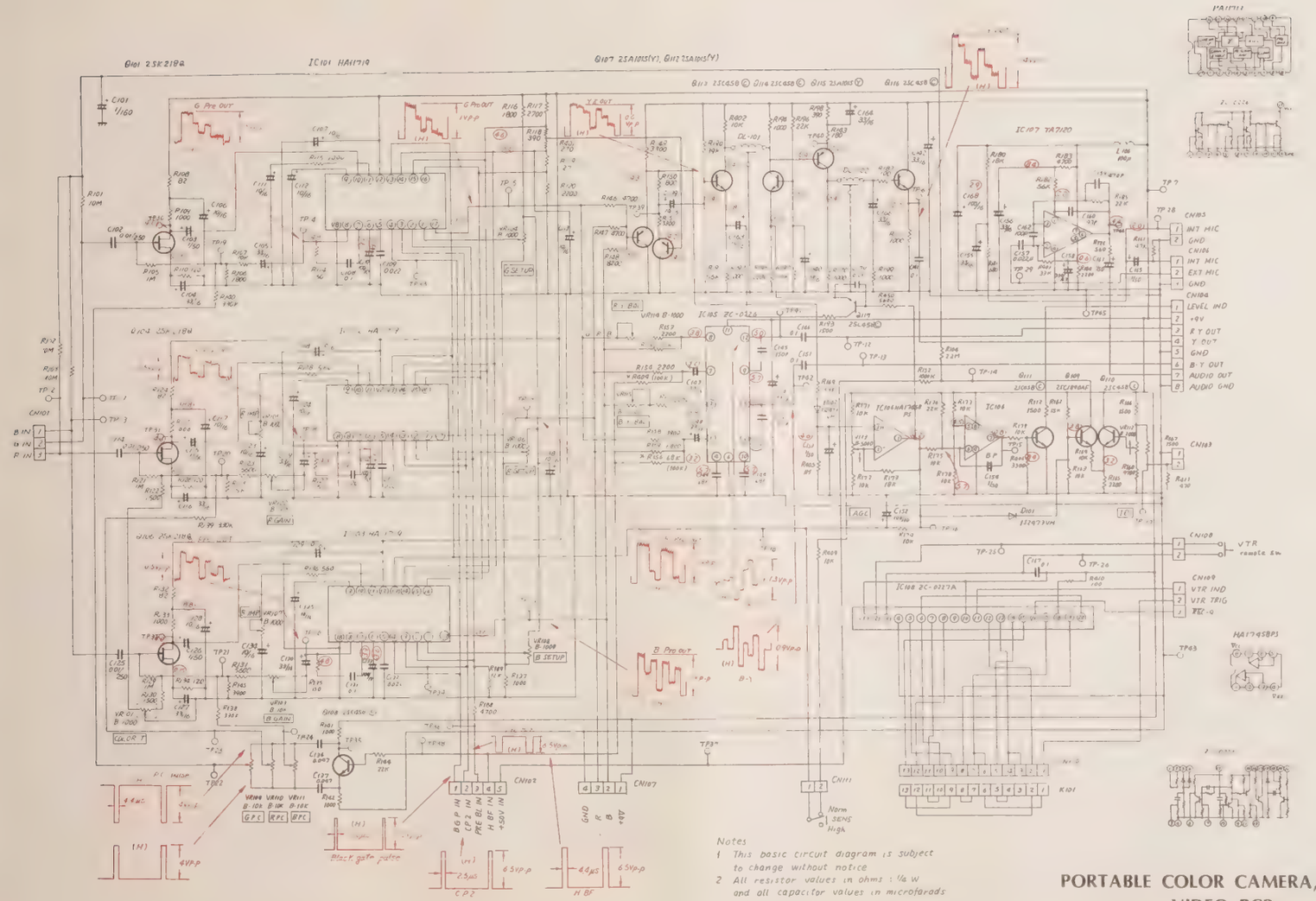
Part Code	Symbol		Description				Remarks
RCE0195		201	Carbon	1/4W	330Ω	±5%	
RCE0156		202	"	"	1500Ω	"	
		203	Not Used				
RCE0218		204	Carbon	1/4W	470kΩ	±5%	
RCE0176		205	"	"	2200Ω	"	
RCE0216		206	"	"	4700Ω	"	
"		207	"	"	"	"	
RCE0176		208	"	"	2200Ω	"	
RCE0197		209	"	"	33kΩ	"	NTSC
RCE0186		210	"	"	2700Ω	"	
RCE0174		211	"	"	22Ω	"	
RCE0175		212	"	"	220Ω	"	
RCE0139		213	"	"	10kΩ	"	
RCE0137		214	"	"	100Ω	"	
RCE0147		215	"	"	1200Ω	"	
RCE0208		209	"	"	39kΩ	"	PAL
RCE0157		301	"	"	15kΩ	"	
"		302	"	"	"	"	
RCE0216		303	"	"	4700Ω	"	
RCE0156		304	"	"	1500Ω	"	
RCE0147		305	"	"	1200Ω	"	
RCE0168		306	"	"	18kΩ	"	
RCE0166		307	"	"	180Ω	"	
RCE0396		308	"	1/2W	22Ω	"	
RCE0215		309	"	1/4W	470Ω	"	
RCE0397		310	"	1/2W	330Ω	"	
RCE0196		311	"	1/4W	3300Ω	"	
		312	Not Used				
RCE0187		313	Carbon	1/4W	27kΩ	"	
RCE0398		401	"	"	2MΩ	"	
RCE0141		402	"	"	1MΩ	"	
			Capacitors				
CEX0179	C	101	Elyc	16V	10μF		
CQE0025		102	Plastic	50V	0.0027μF		
CEX0160		103	Elyc	6.3V	100μF		
CQM0278		104	Plastic	100V	0.1μF		
CEX0235		105	Elyc	"	4.7μF		
CEX0179		106	"	16V	10μF		
CEX0218		201	Elyc	50V	1μF		
CQA0011		202	Plastic	"	0.022μF		
CQA0013		203	"	"	0.047μF		
"		204	"	"	"		
CEX0195		205	Elyc	25V	4.7μF		
CSE0002		206	Tantal	35V	1μF		
CEX0168		207	Elyc	10V	100μF		
CEX0179		208	"	16V	10μF		
"		209	"	"	"		
CQA0013		210	Plastic	50V	0.047μF		
CEX0168		211	Elyc	10V	100μF		
CEX0171		212	"	"	33μF		
CEX0179		213	"	16V	10μF		
CEX0170		214	"	10V	220μF		
CEX0179		215	"	16V	10μF		
CQA0008		301	Plastic	50V	0.0068μF		
CQA0033		302	"	"	0.0033μF		
CQA0008		303	"	"	0.0068μF		
CEX0218		304	Elyc	"	1μF		
CQA0014		305	Plastic	"	0.068μF		
CEX0195		306	Elyc	25V	4.7μF		
CQA0007		307	Plastic	50V	0.047μF		
CQA0012		308	"	"	0.033μF		
CCC1163		309	Ceramic	"	680 pF		
CEX0179		310	Elyc	16V	10μF		
CEX0168		311	"	10V	100μF		
CEX0201		312	"	25V	33μF		
CQE0024		313⚠	Plastic	100V	0.0033μF		
CCX0086		401	Ceramic	1kV	3300 pF		
CQA0037		402	Plastic	200V	0.01μF		



PORTABLE COLOR CAMERA, GP-4D
BLOCK DIAGRAM



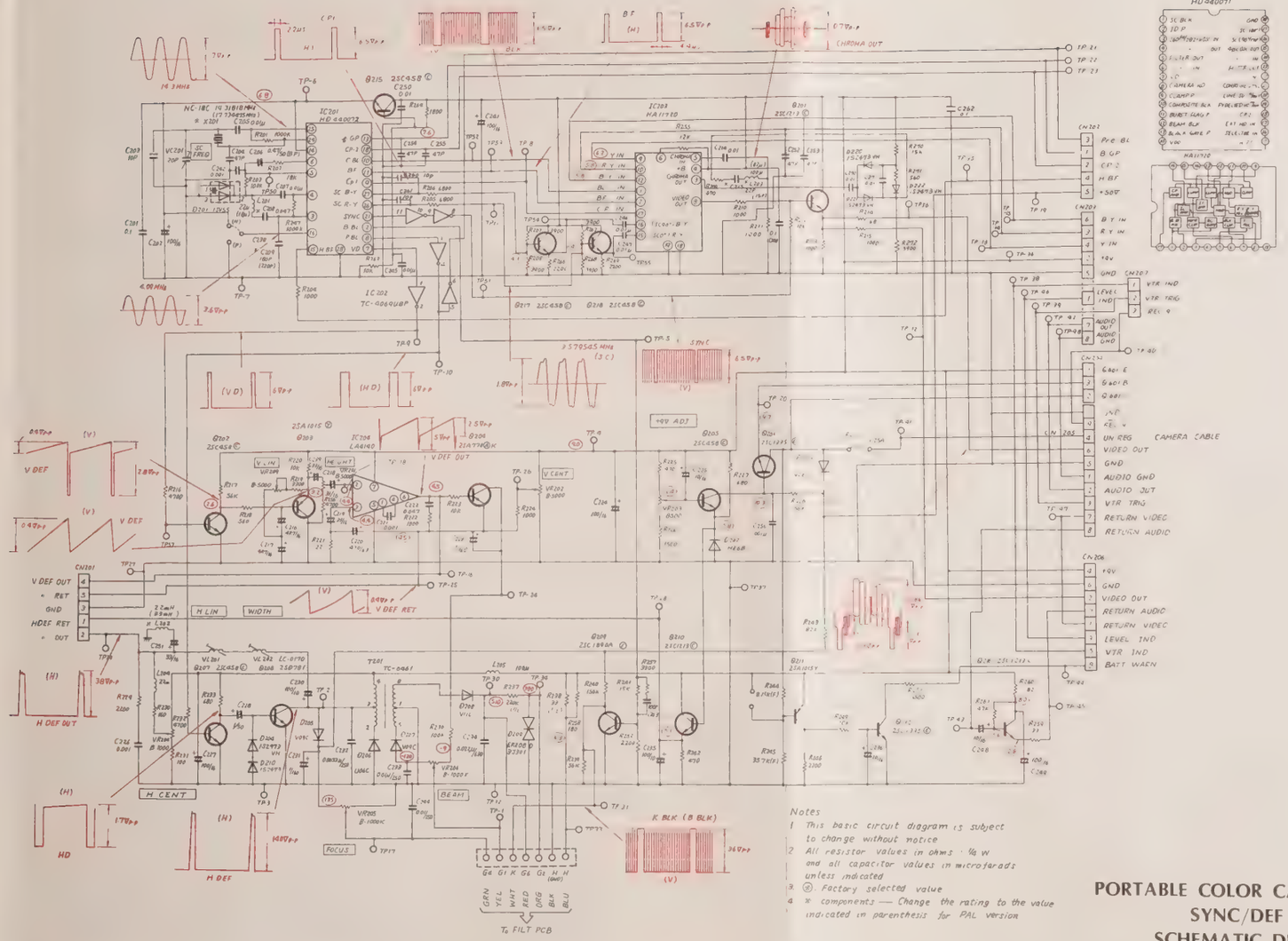
PORTABLE COLOR CAMERA, GP-4D
WIRING GIAGRAM



Notes

1 This basic circuit diagram is subject to change without notice
2 All resistor values in ohms : 1/4 W and all capacitor values in microfarads unless indicated
3 (K): Factory selected value
4 x components — Change the rating to the value indicated in parenthesis for PAL version

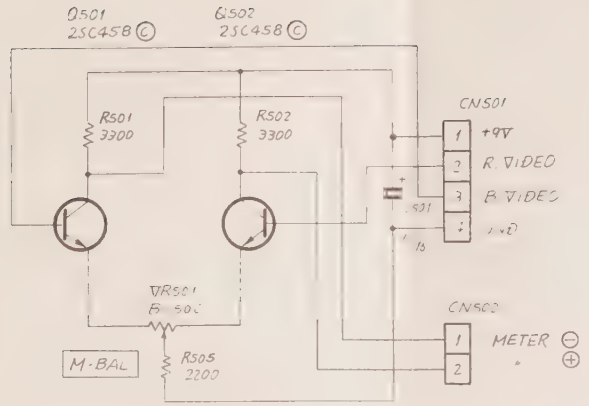
PORTABLE COLOR CAMERA, GP-4D
VIDEO PCB
SCHEMATIC DIAGRAM



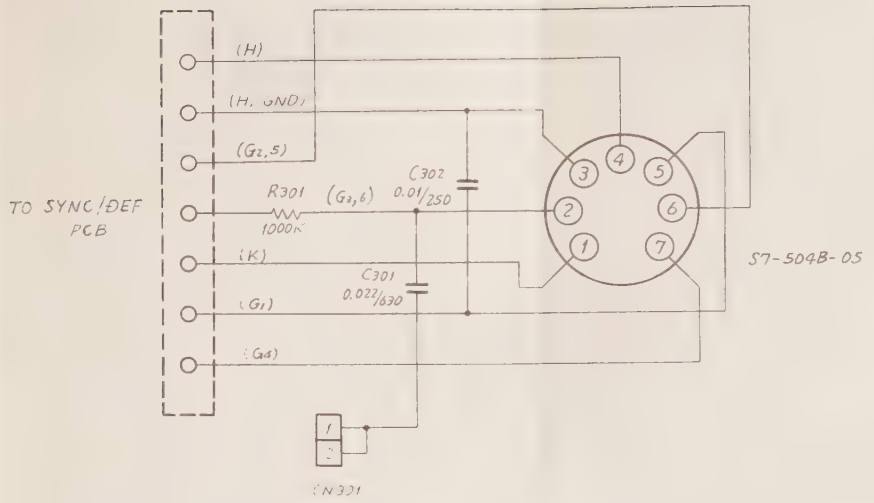
Notes

1. This basic circuit diagram is subject to change without notice
2. All resistor values in ohms : ¼ W and all capacitor values in microfarads unless indicated
3. ⓕ Factory selected value
4. * components — Change the rating to the value indicated in parenthesis for PAL version

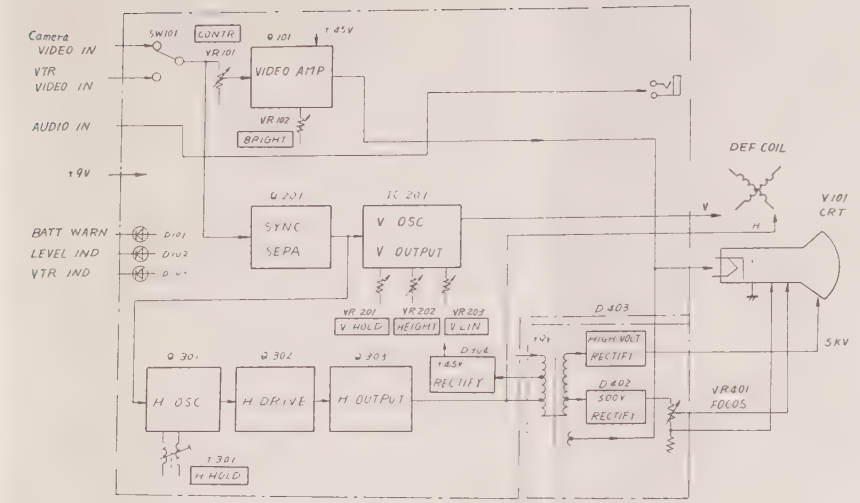
PORTABLE COLOR CAMERA, GP-4D
SYNC/DEF PCB
SCHEMATIC DIAGRAM



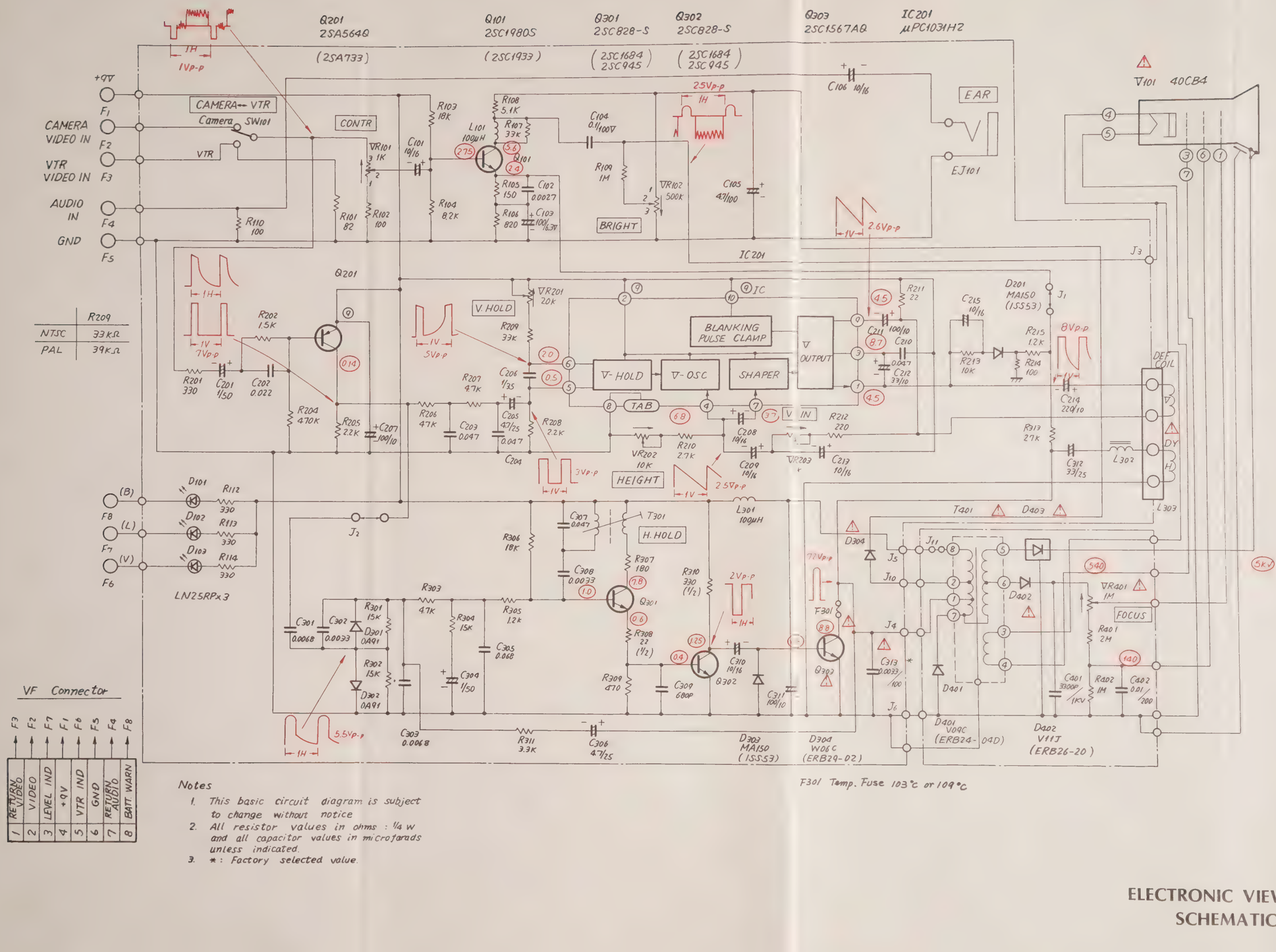
PORTABLE COLOR CAMERA, GP-4D
SUB PCB
SCHEMATIC DIAGRAM



PORTABLE COLOR CAMERA, GP-4D
FILTER PCB
SCHEMATIC DIAGRAM



ELECTRONIC VIEWFINDER, GM-2B
BLOCK DIAGRAM



Notes

1. This basic circuit diagram is subject to change without notice
2. All resistor values in ohms : 1/4 W and all capacitor values in microfarads unless indicated.
3. * : Factory selected value.

F301 Temp. Fuse 103°C or 109°C

PRODUCT SAFETY NOTICE

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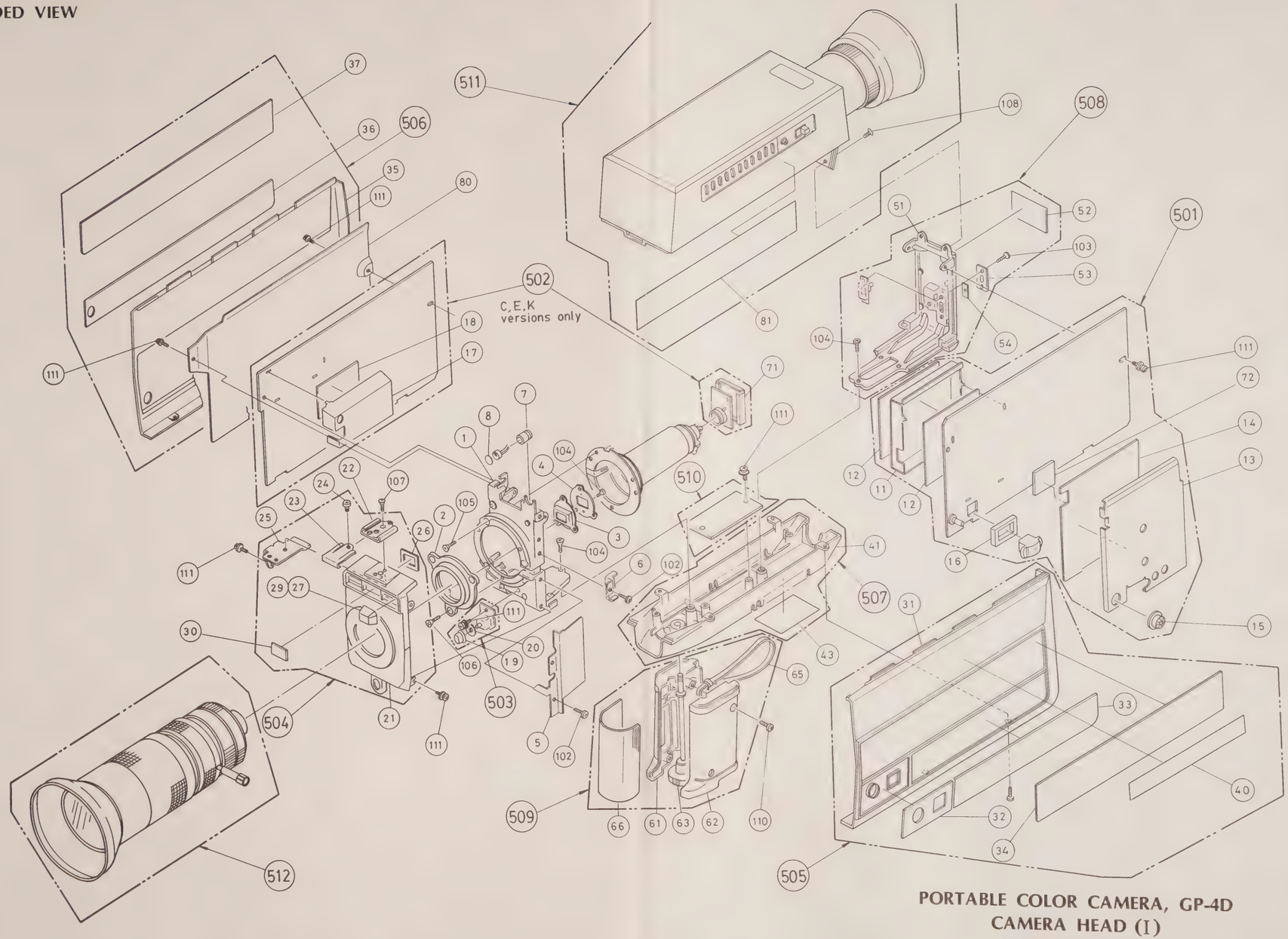
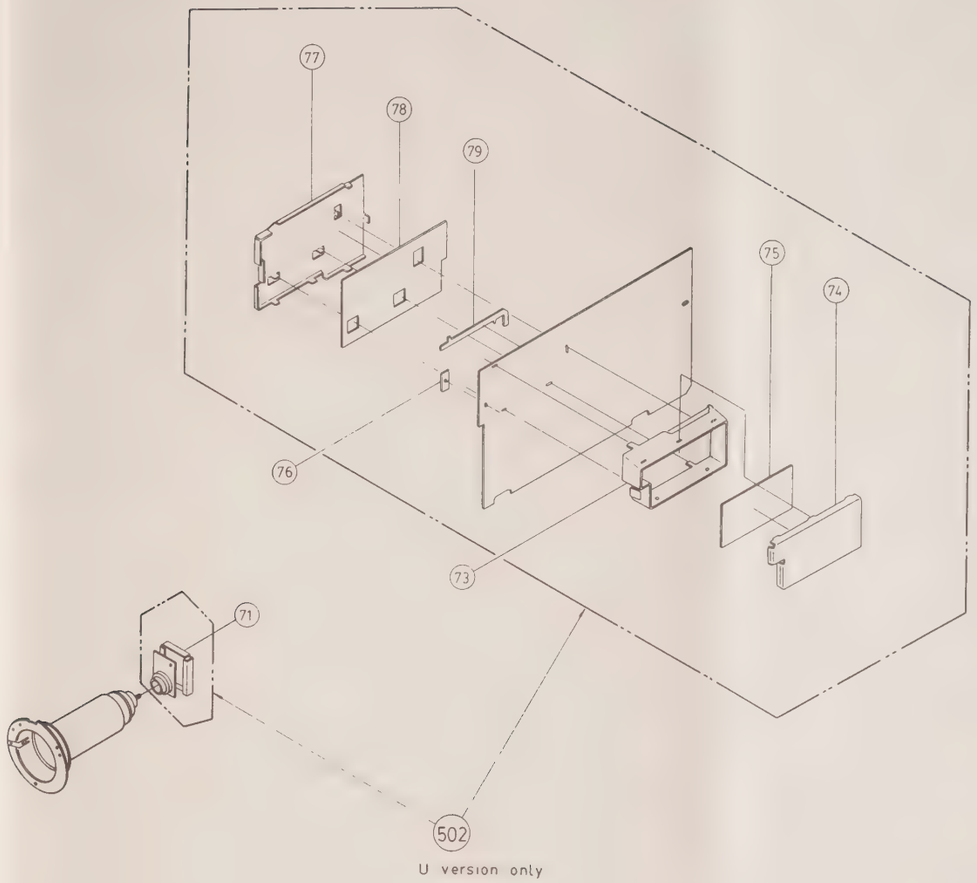
10. MECHANICAL PARTS LIST AND EXPLODED VIEW

CAMERA HEAD

Part Code	Symbol	Description	Remarks
288481A	1	Frame, Front	
8328268A	2	Mount, Lens	
8339203A	3	Frame, Filter	
8328270A	4	Mask, Filter	
8332577A	5	Cover, Lead-A	
8331298A	6	Cover, Lead-B	
8334414A	7	Holder, Microphone	
8334413A	8	Felt, Microphone	
8331294A	11	Shield, cover, VIDEO	
8326424A	12	Insulation sheet, VIDEO	
8332575A	13	Shield cover, VIDEO	
8332576A	14	Insulation sheet, VIDEO	
8326355A	15	Knob, COLOT TEMP., VR	
8326354A	16	Sponge, Meter	
8326435A	17	Shield cover, SYNC	(For E,K,C)
8326437A	18	Insulation sheet, SYNC	(")
8326389A	19	Button, Switch	
4056606Q	20	Washer	
287385A	21	Cover, Front	
8326340A	22	Shoe, Accessory	
8326341A	23	Spring, Shoe	
8326342A	24	Screw, Shoe	
8326356A	25	Bracket, Shoe	
8326399A	26	Window	
8332534A	27	Screen, Wind	
8334415A	29	Holder	
8334718A	30	Plate, Front	
289662B	31	Cover, Left	
8336567A	32	Label, COLOR TEMP., VR	
8334700A	33	Decoration plate, Left	
8335689A	34	Leather, Left side	
289663B	35	Cover, Right	
8334699A	36	Decoration plate, Right	
8335688A	37	Leather, Right side	
3153027A	40	Label, UL	(For U,C)
288482A	41	Cover, Bottom	
8334697F	43	Nameplate, Main	(For U)
8334697G	43	Nameplate, Main	(For E,K)
8334697L	43	Nameplate, Main	(For C)
287384A	51	Frame, Rear	
8334701A	52	Nameplate, Caution	
8332857A	53	Nameplate, Switch	
8334265A	54	Plate, Switch brind	
3147948A	61	Grip-A	
3147949A	62	Grip-B	
8326393A	63	Knob, Grip	
8326395A	65	Assembly, Strap	
8326394A	66	Leather, Grip	
8337016A	71	Cover, FILT	
8332031A	72	Plate	
8346002A	73	Shield cover, SYNC	(For U)
8346003A	74	Shield cover, SYNC	(")
8347646A	75	Insulation sheet (A), SYNC	(")
8347705A	76	Bus Bar (C), SYNC	(")
8347643A	77	Shield cover (Z), SYNC	(")
8347647A	78	Insulation sheet (B), SYNC	(")
8347645A	79	Bus Bar (B), SYNC	(")
3157897A	80	Protector, Shield	(For C,E,K)
3153368A	81	Caution label, X-RAY	
XCA6204	101	Screw, Binding HD 2x4 Nip	
XCA6306	102	" 3x6 Nip	
XCA1889	103	" 2x10 DNip	
XCA6310	104	" 3x10 Nip	
XCA7308	105	Screw, Flat HD 3x8 Nip	
XCA7312	106	" 3x12 Nip	
XCA7205	107	" 2x5 Nip	
XCA1817	108	Screw, Binding HD 3x6 DNip	
XCA1547	110	Screw, Tapping HD 3x10 Znp	
XCA1270	111	Screw, Washer and spring washer 3x8 Znp	
UPG0019	501	Assembly, VIDEO PCB	(For U,C)
UPG0047	501	"	(For E,K)
UPG0045	502	Assembly, SYNC/DEF PCB	(For U)
UPG0046	502	Assembly, SYNC/DEF PCB	(For E,K)
UPG0023	502	Assembly, SYNC/DEF PCB	(For C)
UPG0021	503	Assembly, SW PCB	
3151044B	504	Assembly, Cover, Front	
3153040A	505	Assembly, Cover, Left	(For E,K)
3153040L	505	"	(For U,C)
3153039A	506	Assembly, Cover, Right	
8336592F	507	Assembly, Cover, Bottom	(For U)
8336592G	507	"	(For E,K)
8336592J	507	"	(For C)
8333707D	508	Assembly, Frame, Rear	
3151047A	509	Assembly, Grip	
UPG0022	510	Assembly, SUB PCB	
8334592A	511	Electronic viewfinder	(For U,C)
8334592B	511	"	(For E,K)
8346867	512	Lens, 6x zoom (14-84)	



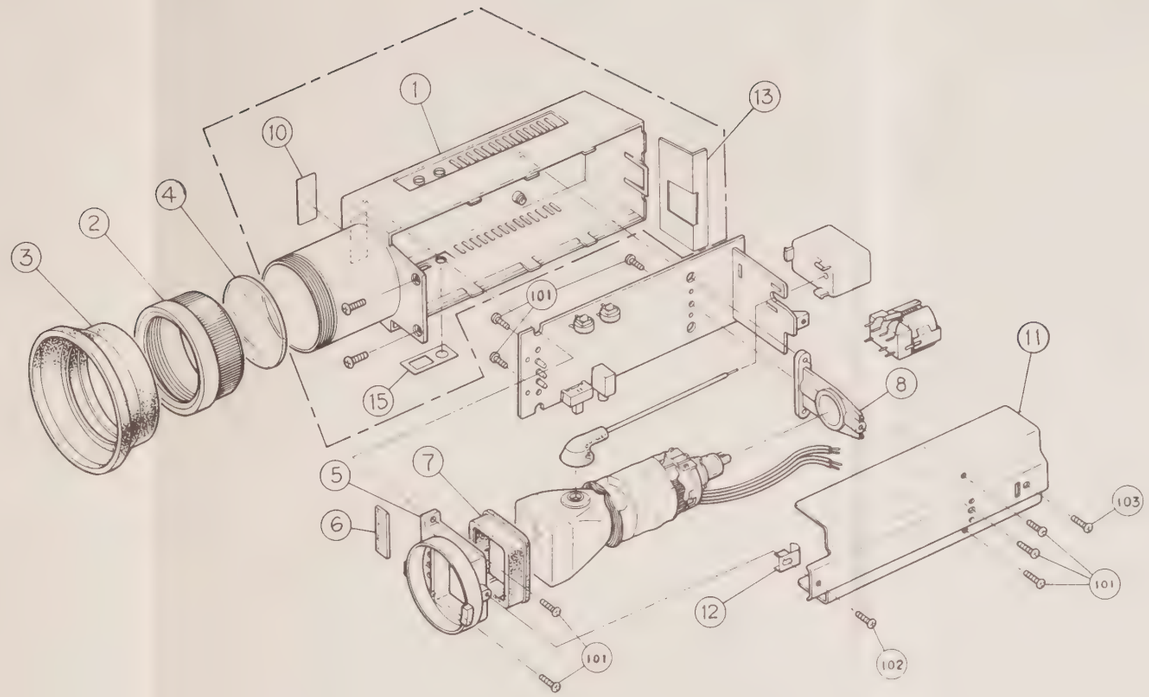
PORTABLE COLOR CAMERA, GP-4D
CAMERA HEAD (I)
EXPLODED VIEW



PORTABLE COLOR CAMERA, GP-4D
CAMERA HEAD (II)
EXPLODED VIEW

ELECTRONIC VIEWFINDER, GM-2B

Part Code	Symbol	Description	Qty
3150603H	1	Cabinet Assembly	1
3147993A	2	Hood, Lens	1
8328309A	3	Eye cap	1
8328317A	4	Lens	1
3147994A	5	Mask, shadow	1
8328314A	6	Nameplate	1
8328301A	7	Rubber, Shadow mask	1
3147996A	8	Holder, CRT	1
8330608A	10	Nameplate, Caution	1
3147997B	11	Case, Shield	1
8328311A	12	Earth bracket, CRT	1
8334741A	13	Sheet	1
8330605A	15	Nameplate	1
XCA1729	101	Tapping screw, Pan HD., 2.6x8 Znp	8
XCA1544	102	Tapping screw, Pan HD., 2.6x10 Znp	1
XCA1140	103	Screw, Pan HD., 2.6x6 Znp	1



ELECTRONIC VIEWFINDER, GM-2B
EXPLODED VIEW

HITACHI DENSHI AMERICA, LTD.*

Headquarters and East Coast Office:
175 Crossways Park West, Woodbury, New York 11797, U.S.A.
Phone:(516)921-7200, TWX:510-221-1899

Northwest Office:
1051 Andover Park West, Tukwila, Washington 98188, U.S.A.
Phone:(206)575-1690, TWX:910-444-2155

West Coast Office:
21015 So. Figueroa St., Carson, California 90745, U.S.A.
Phone:(213)328-2110, TWX:910-349-6952

Midwest Office:
1725 No. 33rd. Ave., Melrose Park, Illinois 60160, U.S.A.
Phone:(312)344-4020, TWX:910-226-0411

Southwest Office:
14169 Proton Road, Dallas, Texas 75234, U.S.A.
Phone:(214)233-7623, TWX:910-860-5775

Southeast Office:
3610 Clearview Parkway, Doraville, Georgia 30340, U.S.A.
Phone:(404)451-9453, TWX:810-757-4228

Central Western Office:
Gateway Plaza, Bldg. No. 3, Suite 505
3538 Peoria, Aurora, Colorado 80010, U.S.A.
Phone:(303)344-3156, TWX:910-932-2993

Washington D.C. Office:
4720 P. Boston Way, Lanham, Maryland 20801, U.S.A.
Phone:(301)459-8262

Cincinnati Office:
11250 Cornell Park Drive, Suite No. 202
Cincinnati, Ohio 45242, U.S.A.
Phone:(513)891-8090

HITACHI DENSHI LTD., CANADA*

Head Office
922 Dillingham Road, Pickering, Ontario, Canada L1W 1Z6
Phone:(416)839-5134, Telex:698-1286

Quebec Office:
8100-G Trans Canada, St. Laurent, Quebec, Canada H4S 1M5
Phone:(514)332-6687, Telex:582-5739

Western Office:
3433-12th St. North-East, Calgary Alberta, Canada T2E 6S6
Phone:(403)276-8508, Telex:382-5861

HITACHI DENSHI EUROPA G.m.b.H.*

Weiskircher Strasse 88
6054 Rodgau-Jügesheim (Rodgaui), West Germany
Phone:(06106)3027-9, Telex:417-849

HITACHI DENSHI (U.K.) LTD.*

Head Office:
Lodge House, Lodge Road, Hendon, London, England NW4 4DQ
Phone:(01)203-4242, Telex:27449

Leeds Office:
Video House, 55 Manor Road, Leeds, England LS11 5PZ
Phone:0532-30294/5

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MODEL AP-4

CAMERA POWER ADAPTOR

SERVICE MANUAL

Hitachi Denshi, Ltd.

TOKYO, JAPAN

HITACHI DENSHI AMERICA, LTD.*

Headquarters and East Coast Office:
175 Crossways Park West, Woodbury, New York 11797, U.S.A.
Phone:(516)921-7200, TWX:510-221-1899

Northwest Office:
1051 Andover Park West, Tukwila, Washington 98188, U.S.A.
Phone:(206)575-1690, TWX:910-444-2155

West Coast Office:
21015 So. Figueroa St., Carson, California 90745, U.S.A.
Phone:(213)328-2110, TWX:910-349-6952

Midwest Office:
1725 No. 33rd. Ave., Melrose Park, Illinois 60160, U.S.A.
Phone:(312)344-4020, TWX:910-226-0411

Southwest Office:
14169 Proton Road, Dallas, Texas 75234, U.S.A.
Phone:(214)233-7623, TWX:910-860-5775

Southeast Office:
3610 Clearview Parkway, Doraville, Georgia 30340, U.S.A.
Phone:(404)451-9453, TWX:810-757-4228

Central Western Office:
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Weiskircher Strasse 88
6054 Rodgau-Jügesheim (Rodgaui), West Germany
Phone:(06106)3027-9, Telex:417-849

HITACHI DENSHI (U.K.) LTD.*

Head Office:
Lodge House, Lodge Road, Hendon, London, England NW4 4DQ
Phone:(01)203-4242, Telex:27449

Leeds Office:
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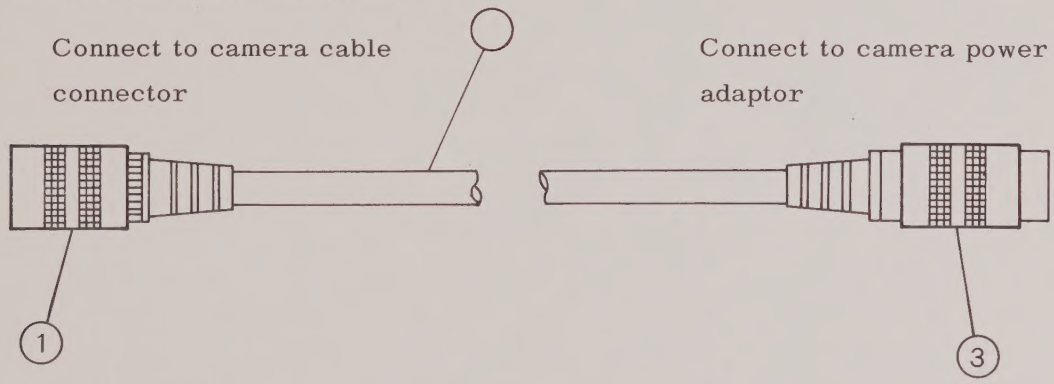
MODEL C102CB AND C501CQ
EXTENSION CABLES

1. GENERAL

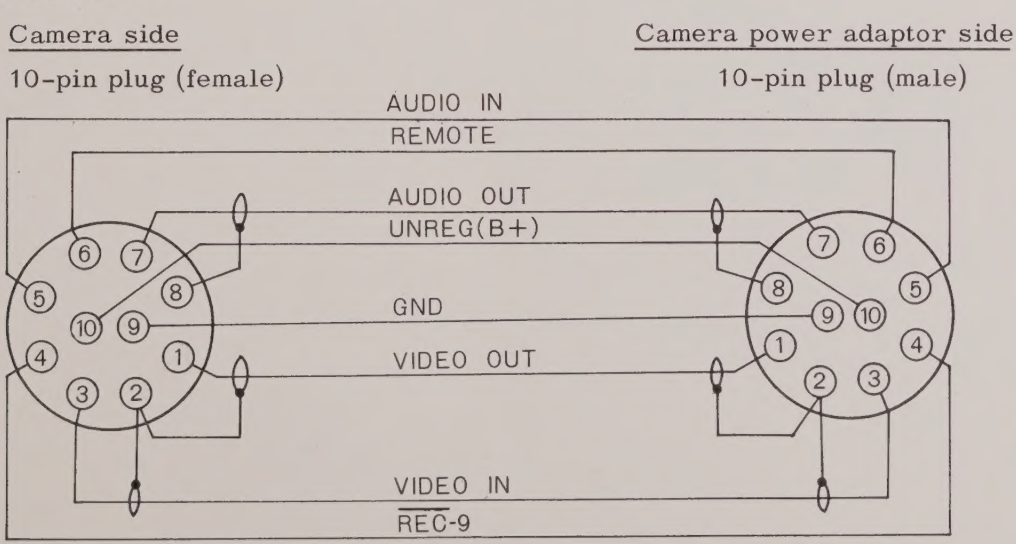
C102CB(10m) and C501CQ(5m) are the extension cables to connect the portable color camera (GP-4B, GP-4D or GP-5A) and the camera power adaptor.

2. NAME OF EACH SECTION



Symbol	Description	Part Code
1	10-pin plug (female), S-I3621	JMS0301
2	Cable (black)	
3	10-pin plug (male), S-I3620	JMS0300

3. WIRING



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